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THE

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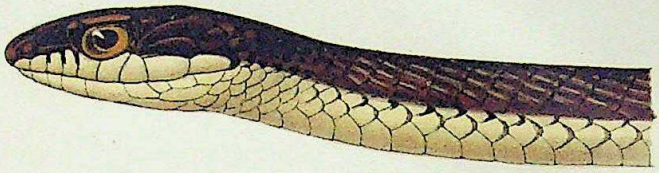

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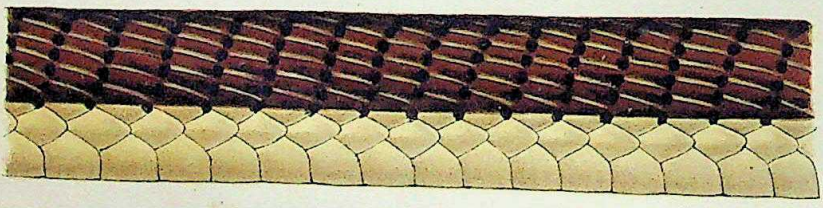

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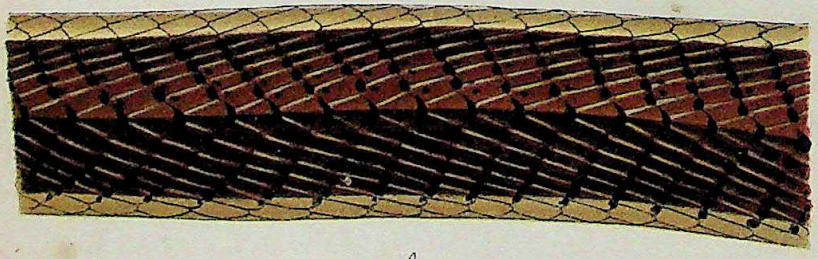

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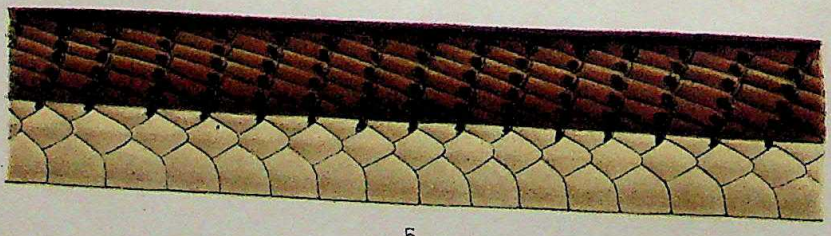

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THE COMMON INDIAN SNAKES (Wall).

J.Green, Chromo.

Dendrophis pictus, *harmless, nat size.*

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Vol. XIX. BOMBAY. No. 4.

# A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I. M. S., C. M. Z. S.

*Part XII with Plate XII and Diagram and Map.*

*(Continued from page 563 of this Volume.)*

The genus *Dendrophis* as now understood comprises at least 11 species, distributed in Southern Asia between India and Indo-China, through the Malayan Archipelago to Eastern Australia. Of these species 6 occur within our Indian limits, *viz.* (1) *pictus* (Eastern Bengal, Eastern Himalayas. Irrawaddy-Salween basin, and Tenasserim and further East to Indo-China), (2) *grandoculis* (Hills of Southern India), (3) *bifrenalis* (Ceylon and Travancore Hills, Ferguson), (4) *caudolineatus* (Ceylon), (5) and (6) *gorei*,* and *proarchos*† (Brahmaputra basin).

Until 1890 several other species were included which have now been grouped together on characters affecting dentition under a separate genus called *Dendrelaphis* by Mr. Boulenger. This genus includes 3 species found in Indian Territory, *viz.* (1) *tristis* (Peninsular India, Eastern Himalayas, Brahmaputra Valley and Ceylon); (2) *subocularis* (Hills of Upper Burma); and (3) *biloreatus*‡ (Brahmaputra Basin).

* Described by me in this Journal, Vol. XIX., p. 829. † Described by me in this Journal, Vol. XIX., p. 827.

‡ Described by me in this Journal, Vol. XVIII., p. 273.



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The species of both genera are very much alike, so much so indeed that some have been much confused. For instance every author who wrote before Mr. Boulenger's present classification was inaugurated, alluded to *Dendrelaphis tristis*, and *Dendrophis pictus* as one and the same snake under the latter title, and the confusion did not end here, for every writer since has committed the same mistake.

I have heard doubts expressed in some quarters as to the justification for the recognition of the two genera just referred to, but as I have a series of skulls of the types of both, I am in a position to be able not only to affirm that the differences claimed exist, but to add others in support. Mr. Boulenger divided the species on characters affecting the maxillary teeth, grouping together those in which the teeth enlarged posteriorly under the heading *Dendrophis*, and those in which they reduced posteriorly under the title *Dendrelaphis*. Figures A. and B. taken from the skulls of specimens of both obtained at Pashok in the Eastern Himalayas illustrate the differences in dentition, but I find in addition that there are decided differences in the shape of the nasal bones, and also in the ridges for muscular attachment on the parietal bones of each (*see* Diagram and figs. A. and B.). The confusion in literature between *D. tristis* and *D. pictus* just referred to makes it difficult for me to speak very positively on the distribution of these species, but I present the facts as they appear to me, with the hope that our readers who are in a position to do so will send me specimens that will enable me to confirm or refute them.

## DENDRELAPHIS TRISTIS (Daudin.)

### *The Indian Bronze-Backed Tree Snake.*

*History.*—The first reference to this snake was made by Russell over a century ago. In 1796* he figured and remarked upon a specimen from Hyderabad (Deccan). In 1801 † he figured and referred to two others from Bombay and Tranquebar.

*Nomenclature.*—(*a*) *Scientific.*—The generic name from the Greek δενδρον a tree, and ελαφις snake, was introduced by Mr. Boulenger in 1890. *Tristis*, the specific title from the Latin "sad" was conferred by Daudin in 1803 in allusion to its sombre colouration.

(*b*) *English.*—The Common Indian Bronze-Backed Tree Snake or

* Ind. Serp., Vol. 1, p. 36 and Plate XXXI. † Vol. II, pp. 29 and 30 and Plates XXV and XXVI.

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Bronze Back. I have heard it alluded to as the painted tree snake, but since all the species are alike in the cærulean adornment which suggested the term painted, this adjective is equally applicable to all.

(*c*) *Vernacular.*—In Ceylon Ferguson* says it is called "haldanda." Mr. E. E. Green interrogated two intelligent Singhalese with respect to this term, and they said they knew a snake of this name which they described as "a very swiftly moving snake of a dark-brown colour," and said it had a yellow belly. The word is from "hal" rice and "danda" a stick or whip. The connection is not very obvious but an observation of Annandale and Robinson's with regard to the snake *D. pictus* suggests itself. They remark that it is often found among bushes at the edge of rice fields. One of the two men above referred to told Mr. Green it is also called "katta-kaluwa," meaning black mouthed, but whether this name is rightly applied to this species seems dubious, as it does not appear appropriate. Ferguson † mentions this term in his list of Singhalese names for snakes, but without specifying the species.

Confusion in vernacular nomenclature with regard to snakes is great, thus we find another Singhalese name, *viz*, "ahaetulla" wrongly applied to this species. Linné‡ in 1754, Laurenti § in 1768 and others since have made use of the term in reference to the snake now identified by Boulenger as *D. pictus*, but it is clear that the word emanating from Ceylon refers rather to the Ceylon snake *tristis*. There is however, now, I think no doubt that "ahaetulla" is the correct Singhalese name for the green whip-snake (*Dryophis mycterizans*), the word implying eyeplucker being synonymous with the "kan-kotti-pambu" of the Tamils in Southern India. Further confusion has arisen with regard to the name "kumberi-muken." Russell¶ connects this name with the snake *D. tristis*, and many others subsequently have followed him, but I think there can be no doubt that it is correctly applied to the green whip-snake (*D. mycterizans*). The name meaning "snouted tree snake" obviously suggests the green whip-snake, and is quite inappropriate to the common bronze-back. Moreover, in a printed copy of a lecture on snakes delivered some years ago by the Rev. Fr. Bertram, S. J., of which I have a copy, this authority says "I believe these two different names (kan-

* Rept. fauna of Ceylon, 1877, p. 20. † loc. cit. p. 40. ‡ Mus. Ad. Frid. p. 35. Plate XXII., fig. 3. § Syn. Rept. p. 79. ¶ Ind. Serp. Vol. I, p. 36 and Plate XXXI.

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kotti-pambu and kamberi-mukken) denote the same snake; for, while the kan-kotti-pambu is acknowledged by all to be the green tree-snake, there is no other tree-snake with an elongated snout which would justify the name kamberi-mukken." Further, the Revd. C. Leigh, S. J., who has 13 years' experience of Trichinopoly, recently wrote to me in response to my enquiries that green whip-snakes were frequently kept in captivity at St. Joseph's College, and the students and visitors repeatedly applied the name kamberi-mukken," "patchai-pambu" and "kan-kotti-pambu" to this species.*

Jerdon† mentions "chitooriki-pambu" as one of the names in use in Southern India, and Dr. J. R. Henderson tells me he has known it called "panaiyeri-pambu" meaning palmyra snake in the same part of India. According to Russell† it is called "rooka" in Mahratti, "goobra" about Hyderabad (Deccan), "maniar" about Bombay, and "mancas" in Guzerat. Mr. E. Muir tells me that at Kalna, Bengal, it is called "bet anchora" which means "lacerated with a cane."

In Cannanore I heard it called "villconi" from the Malayalam villoo a bow (see legends hereafter).

*Colour and markings.*—Dorsally the body is uniformly purple brown, bronze-brown or rarely ruddy-brown, except for the vertebral region which is usually more or less distinctly lighter, and the last row and a half of scales in the flanks, which are yellowish. The vertebral stripe involves the vertebral and half the next row. It may be conspicuous in the whole body length, or only anteriorly. In the neck and fore body a series of oblique, black streaks, often paired, and usually more or less broken up are always more or less evident. A yellow flank stripe passes from the neck to the vent. It is bordered above by a blackish, somewhat indistinct line, but unlike *pictus* is not bordered below by a black line running along the edge of the ventrals.

When the snake under excitement dilates itself, small oblique patches of light sky blue on each scale on the back are brought into view, especially noticeable and brilliant in the forebody. Each patch of blue is broadly edged with black anteriorly, and posteriorly and placed on the lower half of each scale so that it is usually com-

* The confusion is on a par with the Singhalese "karawella," wrongly ascribed by Günther to the Ceylon pit viper (*Ancistrodon hypnale*). Subsequent authors repeated the mistake on his authority, but there is now no doubt, I believe, that it is properly applied to the Ceylon krait (*Bungarus ceylonicus*). † J. A. S. Bengal XXII, p. 529. loc. cit.

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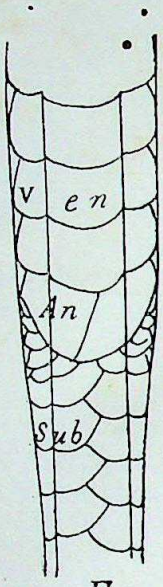
Diagram

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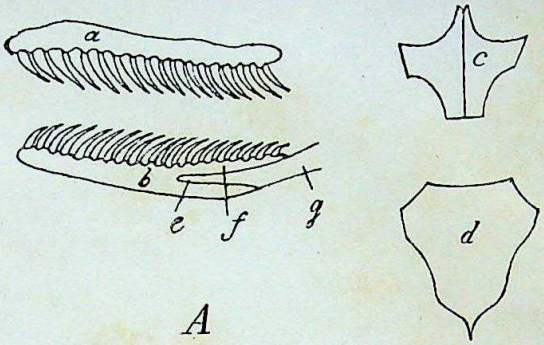


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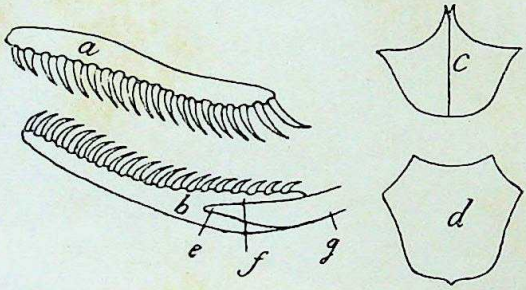


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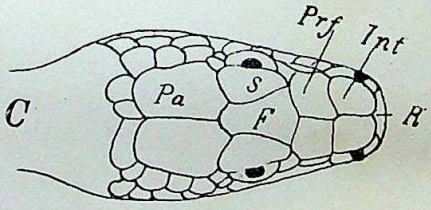


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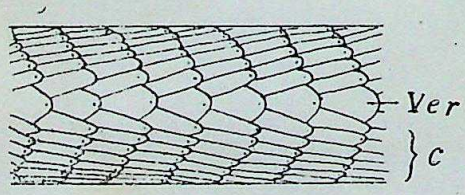


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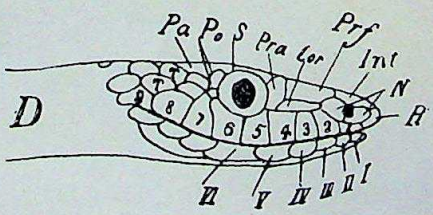


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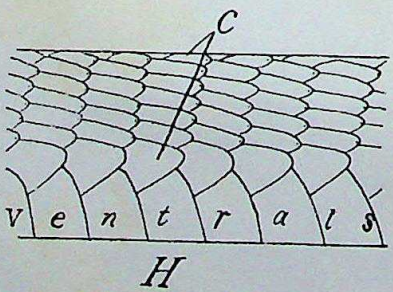


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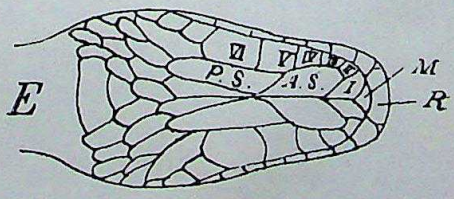


E

COMMON INDIAN SNAKES (WALL).

(*Dendrelaphis tristis*).

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# THE COMMON INDIAN SNAKES.

## Explanation of Diagram I.

A.—*DENDRELAPHIS TRISTIS*, jaws.

B.—*DENDROPHIS PICTUS*, jaws.

(*a*) maxilla.
(*b*) dentary part of mandible.
(*c*) nasal bones.
(*d*) ridges on parietal for muscular attachments.
(*e*) articular notch.
(*f*) articular process of dentary.
(*g*) articular part of mandible.

C. D. E.—Head Shields.

| | |
|---|---|
| A. S. | Anterior sublinguals. |
| F. | Frontal. |
| In. | Internasals. |
| Lor. | Loreal. |
| M. | Mental. |
| Na. | Nasals. |
| Pa. | Parietals. |
| Po. | Postoculars. |
| Pra. | Præoculars. |
| Prf. | Præfrontals. |
| P. S. | Posterior Sublinguals. |
| R. | Rostral. |
| S. | Supraoculars. |
| T. | Temporals. |
| 1, 2, 3, etc. | Supralabials. |
| I, II, III, etc. | Infralabials. |

F.—Belly Shields.

| | |
|---|---|
| Ven. | Ventrals with ridges. |
| An. | Anal. |
| Sub. | Subcaudals with ridges. |

G. H.—Body Scales.

| | |
|---|---|
| C. | Costals. |
| Ver. | Vertebrals. |

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pletely concealed by the overlapping of the scale below it. In our Plate (figures 3 and 4) this ornamentation is not done justice to, the blue being neither bright enough nor broad enough. The head is coloured above like the back, but the upper lip is yellow, creamy-buff, or opalescent abruptly demarcated above. There is a roundish yellow spot in the suture between the parietal shields (not shown by our artist), thin black edges to the 2nd, 3rd and 4th supralabials (sometimes the 1st also), and a somewhat obscure, narrow, black postocular streak not or hardly extending to the neck. The belly is uniform creamy-yellow, pale-greyish, greenish, or bluish green.

The markings to which special attention is to be paid are (1) The interparietal spot; (2) The light vertebral stripe; (3) The black posterior margins to the anterior supralabials; (4) The narrow, short, and often obscure black postocular streak and (5) a more or less obvious black line separating the dorsal brown from the yellow flank stripe. I find these present (except (1) and (2) in a single example from Marmagoa) in all the specimens I have examined from the localities mentioned hereafter under distribution, and none of these are present in specimens of *Dendrophis pictus*. In the Eastern Himalayas where these two species are associated (on slopes below Darjeeling) I saw many specimens last year, and learnt to discriminate between them at a glance, by the marks above referred to.

*Dimensions.*—The longest measurement I know is 3 feet 9 inches. I obtained a specimen of this length in Trichinopoly.

*General characters.*—The Indian bronze-back is remarkably elegant in colouration, and form. Its head is rather elongate, snout bluntly rounded, nostril small, and the eye large and lustrous with a golden iris and round pupil. The neck is very distinctly constricted, the body long, slender, smooth, and rather depressed (*i.e.*, flattened from above downwards). The belly is conspicuously ridged on either side as in *Chrysopelea ornata*. An unusually long tapering tail accounts for nearly one-third the total length of the snake. This appendage is ridged beneath in the same manner as the belly.

*Identification.*—The dual combination of enlarged vertebrals, and ridged ventrals (*see* Diagram I, figs. F and G) proclaims any snake either a *Dendrophis* or *Dendrelaphis*, so that it remains to distinguish this species from others in these two genera. Only 6 of these have 15

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rows of scales in midbody, and the differences between them will be seen at a glance at the following table.

| Number of scale rows in midbody. | Vertebrals as broad or broader than long. | Ventrals. | Anal. | Subcaudals. | Loreals. | Labials touching the eye. | Name of species. |
|---|---|---|---|---|---|---|---|
| 15 | Yes ... | 177 to 211 ... | 2 | 131 to 153 ... | 1 | normally 4th 5th & 6th. | *Dendrophis pictus.* |
| 15 | Yes ... | 154 to 171 ... | 2 | 144 to 155 ... | 2 | 5th & 6th ... | ,, *bifrenalis.* |
| 15 | No ... | 168 to 197 ... | 2 | 115 to 134 . | 1 | 5th & 6th ... | *Dendrelaphis tristis.* |
| 15 | ? | 167 to 172 ... | 2 | 74 to 105 ... | 1 | 5th . | ,, *subocularis.* |
| 15 | ? | 174 to 188 ... | 2 | 117 to 124 ... | 1 | 4th, 5th & 6th . | ,, *grandoculis.* |
| 15 | Yes ... | 184 to 195 ... | 1 | 141 to 153 ... | 1 | 4th, 5th & 6th.. | ,, *proarchos.* |

The most important characters to distinguish *tristis* from its allies are the narrow vertebrals in which the length very distinctly exceeds the breadth, and only two labials touching the eye. To sum up then any snake in which the vertebrals are enlarged, but obviously longer than broad, with ridged ventrals, 15 scale rows in midbody, (*i.e.*, between snout and vent) and two labials touching the eye is *Dendrelaphis tristis.*

*Haunts.*—The common Indian bronze-back like all its allies lives almost entirely in bushes and trees, I became most familiar with it in Trichinopoly in my early Indian days, when I spent a good deal of my leisure time birdsnesting. During my daily excursions I frequently came across it, and have indeed met as many as three or four in a single outing. I frequently discovered it lying on a branch, when peering through low scrub, and if the snake lay still the chances were it would escape detection, looking extremely like a small branch itself. There is no doubt that its colouration is decidedly protective.

An observation of Mr. E. E. Green's in a recent letter exemplifies this. He says—on the 8th of September 1903, he "placed a branch with green foliage in the snake's cage. Formerly all the different snakes coiled up together amongst the dry foliage of a dead branch, but now they have sorted themselves, the green whip snakes (*Dryophis mycterizans*) have moved on to the green branch while the *Tro-*

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*pidonotus* and *Dendrophis* (*Dendrelaphis*, F. W.)—both brown snakes —have remained on the dead branch."

Often gazing up into trees a movement in the foliage twenty or more feet above drew my attention to a snake which when shot proved to be this species. I encountered it more than once in holes in trees, sometimes detecting the snake from the ground level with its head peering forth, or when aloft investigating a likely hole for a bird's nest. Under the latter circumstances a cane thrust into the hole and briskly stirred about effected its exit. Once the snake vacated its quarters so hastily that it fell to the ground. On one occasion in Colombo, I discovered one in the open, and pursued it, but it got into grass, and disappeared beneath a log. With some difficulty the log was overturned, but the snake could not be seen, and yet the ground was such that it was impossible for it to have escaped in any direction unseen. After a considerable search a narrow hole was discovered in the log in which the snake proved to have taken refuge. On more than one occasion I have found its slough entwined among the twigs of a crow's nest, which it had evidently visited with the intention of disencumbering itself of a worn-out vestment, as the slough was perfect or nearly so. On one of these occasions I found the snake in a hole in the same tree, and matched it with the slough.

It not infrequently comes to the ground, and I have often flushed one near the base of a tree, and seen it disappear up the trunk like a flash before I had time to recover the start that such an encounter always gives me. Dr. Henderson, too, remarks in a letter to me that he thinks it visits the ground more often than the whip-snake (*D. mycterizans*). It frequently clambers into the creepers about bungalows, and from here creeps on to the tiles.

*Disposition.*—Though Günther* says of it "When old it is rather ferocious and bites readily" my experience goes to show that it is a timid snake, usually making off with great despatch when alarmed. I have never been struck at by the specimens I have met face to face, or rudely evicted from holes in trees. The specimens I have handled, too, have never attempted to bite me, but it gives me little chance of ascertaining its temper, for if liberated with the object of being played with, it takes advantage of its release so precipitately, and moves with such speed, that the captive of one minute has regained

* Rept. Brit. India, p. 297.

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its liberty the next, and is lost among the branches of the nearest tree. Mr. E. E. Green says that specimens he has kept have always been quite gentle and never attempted to bite when handled. Dr. J. R. Henderson, in a recent letter to me, remarks that in captivity it becomes very tame and inoffensive. Mr. Ingleby quoted by Ferguson says that it is a very lively, and plucky snake, and the fact that Mr. E. E. Green found one devouring a large blood-sucker lizard (*Calotes versicolor*), a most truculent creature when brought to bay sufficiently establishes its reputation for courage, when hunger presses.

*Habits.*—In a former paper of this series I made some remarks upon "flying" snakes (Under *Chrysopelea ornata* in Vol. XIII). It is probable that the common Indian bronze-back can undertake feats of the same nature, for it is endowed with the same peculiar ridges on the belly, that are seen in *Chrysopelea*; further, its close ally *Dendrophis pictus* is one of those snakes that has been reported to spring (fly) from heights. So far as *tristis* is concerned, however, the evidence, though suggestive is not so well authenticated. Though neither Dr. Willey nor Mr. E. E. Green are aware of any native stories of springing or "flying" snakes in Ceylon, Pridham* speaks of a snake called by the natives "ahedoella," and says: "The movements of this snake are rapid, and from its power of springing it is called a flying snake." The evidence seems pretty clear therefore that a "flying" snake exists in Ceylon, but there would appear to be a mistake in the diagnosis of the species for "ahedoella" is the Singalese name for the green whip-snake. (*Dryophus mycterizans*) a far commoner snake which has no reputation for springing as far as I am aware in any of the Provinces included within its wide distribution, and has an entirely different conformation of belly shields. So far as Southern India is concerned Dr. J. R. Henderson tells me that "There is a common belief that *D. pictus* (by which he means *D. tristis*) can jump, but I have never seen it do so."

Its movements are surprisingly rapid as already remarked. It is truly astonishing with what speed it can ascend an almost bare tree trunk from the ground, and disappear in the branches above. I have seen this several times, and it has always struck me that its speed in ascent is as rapid as its movements along the flat. Mr. E. E. Green has been struck by its restless habit and the quickness of its movements.

* Ceylon and its Dependencies, p. 750.

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The tenacity with which it can maintain its hold in foliage under most disadvantageous circumstances I have more than once been witness to. I managed to hustle one on one occasion to the extreme tips of the branches of a small neem tree, but though the slender twigs swayed boisterously under its weight and movements, it remained firmly suspended until I dislodged it with a stick.

Any opportunities of exhibiting its natatory powers are probably rare, but that these are creditable seems certain, for I once encountered one (unless it was *D. pictus*) on a small island in Chilka Lake, fully 2 miles from the main land.

*Food.*—This tree-snake appears to me to subsist under natural conditions chiefly on lizards, but does not disdain other reptilian fare. Mr. E. E. Green tells me that in captivity "it feeds readily upon small lizards (*Agamidæ, Geckonidæ, and Scincidæ*)". He saw one once take and eat a gecko which it swallowed immediately alive. He also once encountered one eating a full-grown "blood-sucker" lizard* (*Calotes versicolor*) and tells me further that young examples are said to feed on grasshoppers. Ferguson quotes Mr. Ingleby as saying that it is very keen after frogs, and particularly tree frogs. Mr. C. Beadon tells me that he once found one eating a blind snake (*Typhlops* sp.) which returned to its kill after having been once disturbed. On occasion it will attack and plunder birds' nests. I once witnessed an encounter between this snake and a pair of black-backed robins (*Thamnobia fulicata*) in the Borella Cemetery in Colombo. My attention was attracted by the distressed behaviour of the birds, which I approached cautiously, and saw on the ground between a group of gravestones a *tristis* with its head well erected. I was so near that I both saw and heard more than one peck delivered (it appeared to me on the head) by the birds in their agitated flights to and fro. An incautious movement on my part, and the snake had slipped away, and no amount of search could reveal its whereabouts. In a croton bush within a yard or two of the encounter I found the robin's nest with eggs. Specimens in the Madras Museum† have fed freely. One ate 79 toads and 1 lizard between the 12th August and 31st March; another 94 frogs from the 1st April to the 21st January following; a third 18 frogs between the 13th February and 31st of March; and a fourth 104 frogs, presumably during the year.

* Spol Zeylanica, April 1906, p. 220. † Administration Report, Madras Govt. Mus., 1896-97.



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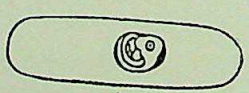
*Sloughing.*—Some excellent notes on this little studied function were made in the Madras Museum some years ago.* During the official year 1896 one shed its skin on the 2nd April, 6th May, 28th June, 27th July and 29th October. Another on the 13th May, 16th June, 21st July and 17th October. In a third instance a specimen which was acquired on the 12th August sloughed on the 24th October. Now, it is very curious, and apparently something beyond coincidence, that in all three cases there was no desquamation in the months of August and September, though in the first two cases there had been a regular ecdysis in several preceding months.

*Breeding.*—My notes are very meagre in this direction, but sufficient to show that the species is ovoviviparous. I received a gravid ♀ on the 29th February 1904 from Mr. Angus Kinloch (Kil Kotagiri, Nilgiris). It measured 3 feet 4½ inches, and contained 7 nearly mature eggs, from 1⅛ to 1¼ inches long, and about $\frac{7}{16}$ inch broad. Mr. E. E. Green had a specimen which laid 4 eggs in its cage on the 11th January 1908, and died next day when 2 more eggs were found in the oviduct. These were all sent to me. The smallest measured 1⅛ × ⅜ inches, and the largest 1⅜ × $\frac{13}{32}$ inches. In cutting open egg I found an embryo coiled up in a spiral fashion, lying in an elliptical chamber situated in the upper part of the yolk substance, and midway between the two poles. The embryo I judged might be an inch and a half long when unravelled. Its head with the primary cerebral vesicle, eye and lower jaw were well developed, as was also the heart, so that it was in just about the same stage of development, that I noted in the case of the Assam species *Dendrophis proarchos*, at exovation. †



Egg showing embryo of *Dendrelaphis tristis* from a specimen from Ceylon. (Natural Size.)

Though the species is obviously oviparous it is probable that minute

* Administration Report, 1896-97.

† Since writing this I have received another gravid ♀ from Mr. Green from Peradeniya (Ceylon) killed at the end of January and containing 7 nearly mature eggs.

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embryo are already in process of formation at the time that the eggs are extruded, for in an allied species in Assam (*proarchos*, Wall) I found embryos in the eggs when laid, and noted that I could see the head and eye and rudiment of lower jaw, and could observe the heart beating. Further observations are required to ascertain if *tristis* lays eggs in which the embryos are equally well developed.

*Legends.*—There is a general belief among the natives of Southern India that the Common Indian bronze-back is fatally poisonous. Russell* records the belief as prevalent in his time, and says that his snake-catcher professed to have known two men killed by it, the bite producing immediate giddiness and death in two days. There is no reason to reject this snake-man's story, for as I have more than once remarked in these papers deaths do occur from the bites of perfectly harmless snakes. Such fatalities are due to cardiac syncope due to fright. In Bengal too as I am informed by Mr. E. Muir (Kalna) the natives say it is very poisonous and attacks without provocation. Russell† also mentions the belief among natives that this snake having bitten a person ascends a tree near the pyre to watch with vindictive satisfaction the smoke rising from the corpse of its victim, after which it descends. I heard this same story in Ceylon, but was never able to discover exactly which snake it was that was credited with this malignant spirit. Dr. J. R. Henderson tells me the belief is still prevalent in Southern India, and he has known a mock funeral with an effigy organised to save the bitten subject, for when the snake descends from the tree the poison it is supposed to have injected leaves the body, and the otherwise doomed person recovers.

In Cannanore there was another strange belief among the natives who said that this snake could thrust its tail into the ground, balance thereon, and assume the form of a bow, hence their name for it "villoonie" from "villoo" a bow. I was never able to understand with what object it is supposed to evince this strange behaviour.

*Distribution.* (A) *Geographical.*—The evidence at my command points to this being undoubtedly the common species to be found in the Indian Peninsular and I believe it exists here to the exclusion of *Dendrophis pictus* as far East as Bengal. My earlier notes on the species are unfortunately deficient in the matter of precise colour, and markings, but I can say with certainty that this is the snake I

* Loc. cit., Vol. II, p. 30. † Loc. cit., Vol. II, p. 31.

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was familiar with in Trichinopoly, and I have taken it in Cannanore. It is certain, however, that the specimens taken in the localities mentioned in the attached map are *tristis*, and not *pictus*.

(*b*) *Local.*—It is a common snake in Ceylon (Ferguson, Haly). It is very common about Trichinopoly and Cannanore. Ferguson says it is common in the Plains and Hills about Travancore * and Mr. Millard tells me also about Matheran. Mr. E. Muir reports it as one of the common snakes about Kalna in Bengal, and has sent me specimens. Jerdon says it is abundant in all parts of the country, but with this I cannot agree. It appears to me to be uncommon in the plains to the north of the Tapti Rivers. I do not think it occurs in the Indus Basin at all, except near the mouth of that river. Blanford, collecting for 3 years at Ajmer, failed to obtain a specimen. The Ganges Valley is too, I believe, outside its limits, except at the Eastern part near the Delta. It has not been recorded from Central India, nor seemingly from the Central Provinces. It is quite common in the Eastern Himalayas (circa 2,500 to 5,000 feet) in the vicinity of Darjeeling.

*Lepidosis. Rostral.*—Touches 6 shields; the rostro-nasal, and rostro-internasal sutures subequal. *Internasals*—Two; the suture between them equal to, or nearly equal to that between the præfrontal fellows, and rather shorter than the internaso-præfrontal sutures. *Præfrontals.*—Two; the sutures between them equal to, or rather greater than, the præfronto frontal sutures; in contact with internasal, postnasal, loreal, præocular, supraocular and frontal. *Frontal.*—Touches 6 shields; the fronto-supraocular sutures three to four times the fronto-parietal sutures. *Supraoculars.*—As long as the frontal, and about as broad along a line connecting the centres of the eyes. *Nasals.*—Two, completely divided; the nostril placed almost entirely in the anterior shield; in contact with the 1st and 2nd supralabials. *Loreal.*—One elongate, twice or more than twice as long as high, about as long as the two nasals taken together. *Præocular*—One, barely reaching the top of the head. *Postoculars*—Two. *Temporals*—Two, elongate. *Supralabials.*—Normally 9 with the 5th and 6th touching the eye†. *Infralabials.*—6, the 6th much the largest, as

* Bombay N. H. Journ., Vol. X, p. 5.

† This is so in 26 out of 29 specimens I have noted upon. In 2 instances these shields are not recorded, and in a single example the 4th just touches the eye on both sides. In one of the 26, there are 8 shields on one side only, the 4th and 5th touching the eye.

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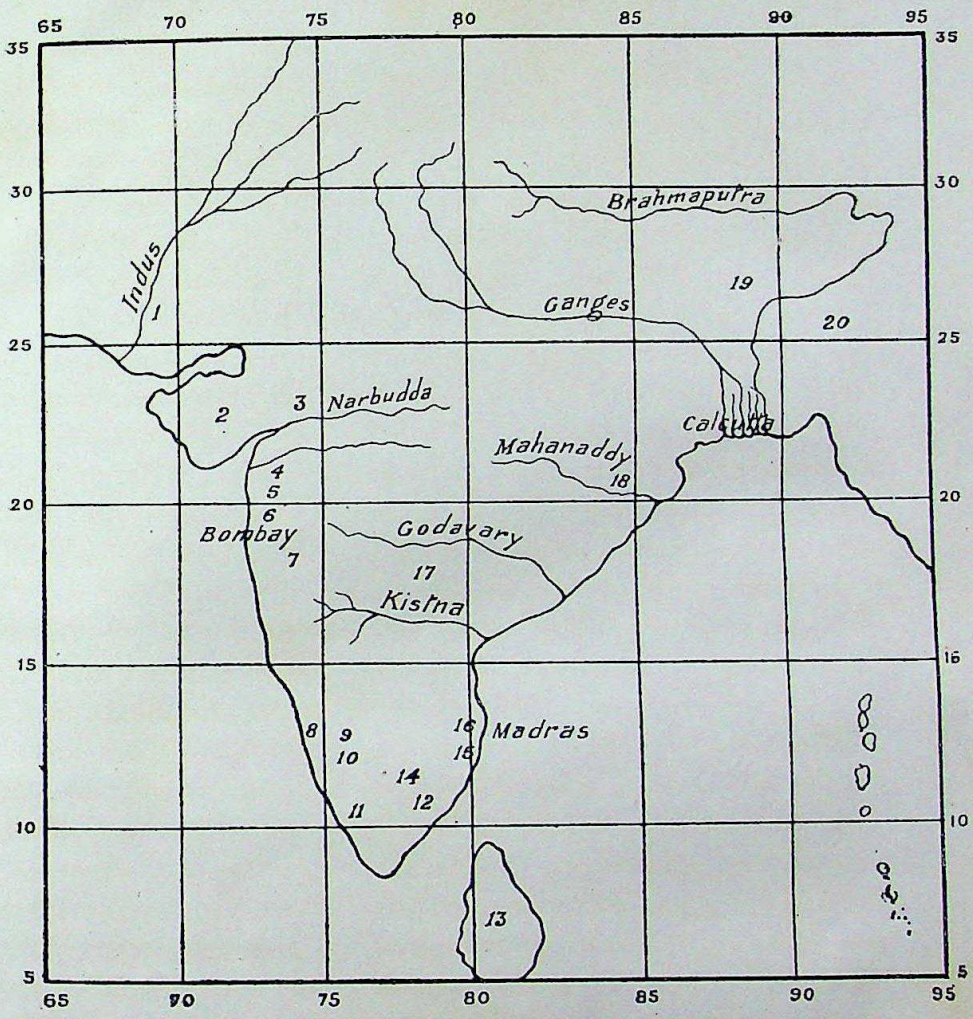


MAP SHOWING DISTRIBUTION OF *DENDRELAPHIS TRISTIS.*

(1) Sind (B.M.). (2) Guzerat (Russell). (3) Baroda (Bo. M.). (4) Surat (Bo. M.). (5) Thana (Bo. M.). (6) Bombay (Russell). (7) Matheran (Bo. M.). (8) Cannanore (F.W.). (9) Kil Kotagiri, Nilgiris (F.W.). (10) Coimbatore (F.W.). (11) Travancore (Bo. M.). (12) Ramnad (I.M.). (13) Ceylon (B.M.). (14) Trichinopoly (F.W.). (15) Tranquebar (Russell). (16) Madras (F.W.). (17) Hyderabad (Russell). (18) Jashpur, Chota Nagpur (Blanford, J. A. S. Bengal, Vol. XL., p. 431). (19) Himalayas below Darjeeling (B.M. & F.W.). (20) Khasi Hills (B.M.).

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long on the 3 preceding shields, in contact with two scales behind; the 5th and 6th touching the posterior sublinguals. *Sublinguals.*—Two pairs; the posterior decidedly longer. *Costals.*—15 at a point two head-lengths behind the head, and to well beyond midbody, when they reduce to 13, and then to 11 or even 9, before the vent. The reduction from 15 to 13 is due to the absorption of the 4th scale above the ventrals into the row above or below; that from 13 to 11 results from a fusion of the 5th and 6th rows above the ventrals; and when the number further reduces to 9, the 5th row is absorbed into one of the adjacent rows. The vertebrals are enlarged, but they are very distinctly longer than broad in midbody, they arise in the neck by a fusion of 3 rows, thus differing from the genus *Bungarus*, where they gradually develop from a single row progressively enlarging, and unlike the genus *Bungarus* they cease above the anus. The ultimate row is much enlarged considerably exceeding the vertebral in breadth. Keels are absent everywhere. Apical pits are present, and single. *Ventrals.*—168 to 197, varying in number with locality *; sharply ridged (keeled) on each side. *Anal* divided. *Subcaudals* divided, 115 to 146; keeled like the ventrals. *Dentition.*† *Maxillary.*—17 to 22: the first 3 or 4 progressively increasing, the posterior, 3 or 4 compressed and progressively decreasing, so that the last is about two-thirds the length of the longest in the series. *Palatine.*—11 to 14, subequal, and as long as the longest maxillary. *Pterygoid.*—19 to 24 (except the Kil Kotagiri specimen which has 28 and 29); smaller than the palatine. *Mandibular.*—20 to 26 (usually 20 to 22); the first 3 or 4 progressively increasing, the posterior gradually decreasing. The length of the articular process equals the length from the articular notch (see fig. A. 6) to about the 4th tooth.

## DENDROPHIS PICTUS (Gmelin).

### *The Himalo-Malayan Bronzeback.*

*Nomenclature.* (*a*) *Scientific.*—The generic name from the δενδρον a tree and οφις a snake, was applied by Boie in 1827; the specific

* In 19 specimens from various parts of India other than the Eastern Himalayas, they are 168 to 192. In 9 Eastern Himalayan examples they are 190 to 197.

† This is based on 10 skulls in my collection from Pashok (Eastern Himalayas), Madras, Matheran, and Kil Kotagiri (Nilgiri Hills).

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from the Latin meaning "painted" was given by Gmelin in 1788 in allusion to the sky blue patches on the scales seen in this, and other species of the genera *Dendrophis*, and *Dendrelaphis*.

(*b*) *English.*—In contradistinction to the last I think it should be called the Himalo-Malayan bronze-back.

(*c*) *Vernacular.*—In the Patani-Malay States Annandale and Robinson* say it is called "ular lidi", "ular"-snake, and "lidi" the midrib of the cocoanut palm. They remark that the appropriateness of the name is realized when one sees a leaf of this palm from below, with the midrib black against the sky, and an apparent light space on either side of it, due to the comparative narrowness of the leaflets where they leave it.

*Colour and markings.*—Dorsally the snake is uniform bronze-brown down to the middle of the penultimate row, where a faint black line abruptly demarcates the dorsal colour from a yellow flank stripe. The costal scales where overlapped, exhibit a patch of sky blue bordered with black before and behind. These are usually concealed, but when the snake dilates itself become very conspicuously apparent. The head is coloured like the dorsum above, this hue abruptly giving place to yellow on the side of the face. A very conspicuous, broad, black band behind the eye passes back to the side of the body, and is continued in the whole body length as a conspicuous black line on the edge of the ventrals, bordering the yellow flank stripe below and rendering it specially evident. The belly is uniformly yellow, greyish, or greenish.

It will be noticed that many of the distinctive marks seen in *Dendrelaphis tristis* are absent, *viz.*, the light vertebral stripe, the interparietal spot, and the black margins to the anterior supralabials.

On the other hand, a very distinct, broad postocular band is to be seen in *pictus* passing well down the body, and the light flank stripe, is bordered below by a black line. These colour differences were noted by me 10 years ago on comparing Burmese with South Indian examples, and made me think the two snakes probably different, but I was deterred from declaring my conviction, finding but one difference in lepidosis, *viz.*, the contact of the supralabials with the eye. Since this I have learnt that there is a very noticeable difference between

* Fascic. Malay. Batrach. and Rept., October 1903, p. 163.

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the two in the development of the vertebrals, and still more recently in the dentition.

I may mention here that the sky blue adornment just referred to is not of sexual import, since it is to be seen in both sexes from the earliest ages, and at all seasons.

In the Andaman Islands a snake of this genus occurs which has hitherto been considered merely a variety of *pictus*, but which may prove to be a distinct species. It is referred to by Blyth in his book "The Andaman Islanders" (p. 365) as being remarkably rich coloured, green, and variegated, and appears to be common according to this authority. Stoliczka* also speaks of it as being common, and says it is a "beautifully bright yellowish and green during life, each scale blackish in the posterior half." The same authority† says that the usual continental form inhabits the Nicobars. and the Cocos, but the green form is peculiar to the Andamans. It is not however the only form found in this last Insular group, since Dr. Annandale has sent me a specimen very similar to the Burmese form except that the postocular stripe is narrow and obscure, the scales are heavily outlined with black and there is no black line in the flanks at the edge of the ventrals. He remarks that the majority of the specimens from these Islands are of the green variety, *i.e.*, *andamanensis*.

Anderson‡ describes this green variety in greater detail than the other authorities alluded to. He says it is grass-green above, each scale with a broad black margin, and the ventrals with a black margin, as far as the keel. The black margins of the scales, are so broad that when body is at rest, by the overlapping of the scales, the whole side of the body appears black. A black line beginning in the lore reappears behind the eye, and extends to the neck where it becomes broken up into spots.

I have not seen this form in life, but in spirit it appears uniform Oxford blue, acquiring just the same hue that many other green snakes (*Dryophis*, *Lachesis*, *Dipsadomorphus cyaneus*, etc.,) do in spirit owing, I believe, to the green colouring matter dissolving out. The preservative certainly acquires a distinctly greenish tinge. In the specimen I examined only the 5th and 6th labials touched the eye, and the last ventral was divided. If these two characters are constant

* J. A. S. Bengal XXXIX, p. 193. † J. A. S. Bengal XLII, p. 163.
‡ P. Z. S. 1871, p. 184.

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there is no doubt that the snake should rank as a definite species. A study of the dentition would decide the point.

*Dimensions.*—The largest specimen of the typical variety I know of is the one collected by Evans and myself in Rangoon, which measured 4 feet 3 inches.

*General characters.*—Practically identical with those enumerated under *D. tristis.* I know of nothing special calling for remark; except that the tail appears to be relatively longer than in *tristis,* being usually fully one-third the total length of the snake, and often rather longer. The tongue is red with black tips (Flower).

*Identification.*—The remarks made under *D. tristis* are applicable here. A combination of the following characters will establish its identity:—(1) Vertebrals enlarged, and as broad as long or nearly so in midbody; (2) Ridged ventral shields; (3) Scales in 15 rows in midbody; (4) Divided anal; and (5) Subcaudal shields 131 to 153. As this snake is by far the commonest of the species in the genera *Dendrophis and Dendrelaphis* within the territory referred to hereafter, it is probable that any snake with the first two characters just mentioned will prove to be *pictus.*

*Haunts.*—Its haunts are precisely those of its common Indian ally *tristis.* That it will leave its arboreal environment, in quest of food is shown by Flower who found a marsh haunting frog *Rana macrodactyla* in the stomach of one specimen. In Burma it was found in trees, and bushes, in verandah creepers, the trellis-work screens around tennis-courts, and similar situations usually, and Annandale remarks that in the Malay States it is more usually found in bushes near the ground than in trees.

*Disposition.*—I believe it is a timid, inoffensive reptile, much like its Indian cousin *tristis.* A specimen I had in captivity was notably so, for when first caught by the tail it did not venture to menace or bite, but merely struggled to escape. In its cage it retired to the furthest part when the glass was approached, and could not be roused to anger by drumming on the glass or waving objects before it.

*Habits.*—Its springing ("flying") habit is, I think, clearly established. Shelford, who remarked upon this extraordinary habit* mentioned *Dendrophis pictus* as one of the species credited by the

* Prol. Zool. Soc. Lond., 1906, p. 227.

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natives of Sarawak with the power of springing, and Dr. Annandale writing to me some time back told me that he had witnessed the flight of a *Dendrophis pictus* between two trees in the Malay States, and caught the snake in his butterfly net.

*Food.*—The only specimen of eight collected in Burma which had recently fed, contained a tree frog, and Flower has known *Rana macrodactyla*, a marsh frog taken. I suspect that its gastronomic tastes are much the same as those of *tristis*.

*Breeding.*—I have no breeding events to chronicle from any source.

*Distribution.* (*a*) *Geographical.*—Variety *typica*, occurs in the Eastern Himalayas about Sikkim up to an altitude of about 4,000 feet, probably the plains of Eastern Bengal, but I am not certain of this, Assam probably,* but I am not certain; one specimen I collected I referred with some doubt to this species, the Irrawaddy-Salween Basins (The Andamans, Nicobars and Cocos?), † Indo China, Malay Peninsula, and the Malay Archipelago from Sumatra to the Philippines.

It is impossible to say whether the snake reported by Stoliczka‡ as common in the Himalayas, in Kumaon and Sutlej is *pictus*, or *tristis*. I have never met with a specimen from the Western Himalayas, and this is the only allusion I can find of such in literature.

I think I am justified in doubting the habitat of Colonel Beddome's specimen in the British Museum said to be from the Anamallays.

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* The common species in this province is *proarchos* (Wall) which is described in a paper appearing in this number (p. 827) on the snakes of Assam.

† I have lately received a specimen from the Andamans from Dr. N. Annandale. In coloration and markings it was very like *tristis*, except that there was no interparietal spot, and no light vertebral streak. Having prepared the skull I find that it combines the characters of *pictus* and *tristis*, and this being so, I think one has no course open to one but to concede to it the rank of a very closely allied but distinct species. I await further specimens before describing this in detail.

‡ My reasons for doubting this record are that at least six other Himalo-Burmese snakes are recorded from South India on the sole authority of Beddome; these are *Tropidonotus parallelus*, *T. subminiatus*, *himalayanus*, *Lycodon jara*, *Simotes splendidus*, and *Bungarus fasciatus*. Beddome evidently received snakes from the Eastern Himalayas and Burma because he presented the following snakes to the British Museum from these localities: *Simotes albocinctus*, *S. cruentatus*, and *Dipsadomorphus hexagonotus*. It seems probable, therefore, that the six species first enumerated and also a *Dendrophis pictus* were likewise collected in Burma, or the Eastern Himalayas, and inadvertently mixed with his South Indian collections.



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This is the only record of this snake from Peninsular India (excluding Bengal), and until another specimen is forthcoming the record is best ignored.*

*Variety.*—*Andamanensis* appears to be peculiar to the Andaman Islands.

(*b*) *Local.*—Variety *typica* inhabits the plains and low hills ascending to a level of about 4,000 feet (Stoliczka says 6,000 feet). It is fairly abundant in the Sikkim Himalayas. In Upper Burma (Bhamo) Anderson reported it common, but two of the three specimens collected by him are obviously the species, subsequently described by Boulenger as distinct, *viz.*, *subocularis*. Evans and I found it by no means common in Lower Burma, acquiring but 6 specimens out of a total of about 750 snakes. In the Malay Peninsula Flower says it is by no means rare, and Annandale and Robinson refer to it as probably the most abundant snake in the cultivated parts of the Malay States. Variety *Andamanensis* is said to be common in the Andamans.

*Lepidosis.*—The scale characters are so extremely similar to those of *tristis* that I need not repeat what I have said under that species. The two differences that I have been able to discover are (1) that three supralabials, the 4th, 5th and 6th usually, but by no means always, touch the eye and (2) that the vertebrals are as broad, or nearly as broad as long in the middle of the body.

*Dentition.* (*a*) *Maxillary.*—20 or 21 ; the first 3 or 4 progressively increasing in length, the posterior 3 or 4 decidedly more compressed, but not longer than the preceding. (*b*) *Palatine.*—13 or 14, subequal and as long as the maxillary. (*c*) *Pterygoid* 20 to 26, subequal, smaller than the palatine. (*d*) *Mandibular.*—20 to 22 ; the first 3 or 4 progressively increasing in length, the series then very gradually decreasing posteriorly.

*Osteology.*—The shape of the nasal bones (fig. B c) is strikingly different from that of *tristis*, so are also the ridges on the parietal bone (fig B d). The length of the articular process of the dentary (B f) equals the distance from the articular notch to about the 8th tooth.

(*To be continued*).

* J. A. S. Bengal, XL, p. 431.

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# ON A LOCAL FORM OF THE CHINESE TODDY-CAT TAKEN IN NORTH BURMA BY CAPT. A. W. KEMMIS, BURMA MILITARY POLICE.

BY

R. C. Wroughton.

*Paguma larvata intrudens*, subsp. n.

A local race of *P. larvata* of the Lower Yangtse Valley from which it differs in the exaggeration of the white markings of the head and neck.

Size about the same as in typical *P. larvata*.

Fur rather short (40 mm. on the back), coarse and rather harsh. General colour a buffy shade of 'isabella'; underfur and basal one-third of individual hairs pale drab, median third of latter black, terminal third 'buff.' Face black, a median white stripe from the nose over the vertex to the level of the shoulders, a detached white patch on the back seems to indicate a tendency to a still further prolongation backwards, of this median white line (in an Ichang specimen, this white extends at most to the base of the neck); the usual white spots on the cheeks and above the eyes; the white spot at the base of the ear produced backwards as far as the base of the neck and merging inferiorly into the white throat patch. Ears and chin black. Whole throat pure white. Hands, feet and distal half of tail black, basal half of tail like back, ventral surface whitish, individual hairs on anterior half blackish basally for half their length, bases of hairs on posterior half of belly dirty white.

Skull not differing materially from that of a slightly younger individual from Kiukiang on the Yangtse R., except in being somewhat larger.

*Dimensions of the type*—Head and body, 600 mm.; tail, 575; hindfoot, 90.

Skull: greatest length, 118; basilar length, 110; greatest breadth, 105; upper carnassial 7·8 × 8·3, first upper molar 8 × 7·5.

*Habitat*—Sima near Myitkyina—North Burma.

*Type*—Adult female—B. M. No. 9, 7, 20, 6. Original Number 6. Collected on 19th November 1908 by Capt. A. W. Kemmis.

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Burma Military Police, and presented by him to the Natural History Museum.

The Indian type of *Paguma* is *grayi* (and its races) the distribution of which is given by Blanford (Mammals No. 55) as "Throughout the Eastern Himalayas in Assam, Sikkhim, and Nepal and as far east as Simla." The Malayan animal is *P. leucomystax* Gray, and it is therefore most interesting to find the present form of the Chinese *larvata* group in North Burma rather than some form allied to either *grayi* or *leucomystax*.

I would venture to appeal to members serving in Burma to try and obtain specimens and help to solve the question how far south *intrudens* goes before it is displaced by *P. leucomystax*.

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# PHEASANT SHOOTING ROUND ABOUT HILL STATIONS IN NORTHERN INDIA.

BY

"PINE MARTEN."

Most of the hill stations of Northern India are situated on the lower ranges of the Himalayas, the elevation varying from 6,000 to 9,000 feet. It is the lot of many of us in the Punjab to gather together our belongings at the advent of the hot weather, and having sorted them a bit, pack up a certain portion and track to the hills there to remain for from 5 to 7 months. This exodus from the plains is looked upon with mingled feelings; some think they are in for a bad time and mean to just exist, as far as any sort of amusement is concerned until the next cold weather, when they will be able to return to polo, races, gymkhana, etc.; others mean to enjoy the various diversions there are to be had near at hand in the station itself. A few having to go to a hill station instead of getting leave and roaming in or beyond Kashmir on shikar intent make up their minds to take full advantage of anything that may be had in the way of shikar in their neighbourhood. In hill shooting near a station you will not get much unless you take every advantage of information and go out and prospect yourself before the shooting season commences. In one station there may be only chukor to be shot, but at others there may be a much greater variety, such as leopard, black bear, gooral, karker ("kukur" as the natives call him), pig (there will probably be no rideable country within 20 miles at least) of Pine Marten, whose skins are excellent, if you get at them directly you arrive on the hills in April and again October, kalij and koklass pheasants, and in a few places the beautiful "Moonal" pheasant called by the natives "Leveet," last but by no means least the ubiquitous chukor, the most sporting of the whole lot. I have also shot the true English wood-pigeon* and woodcock, the former I imagine only a winter visitor. I saw one kept in a cage by natives as a pet.

Of the above category the pheasants only are of present interest, so I will first give a brief description of the birds or rather of the kalij

* The true "English wood pigeon" *Columba palumbus*, is replaced in the Himalayas by the Eastern Woodpigeon, *Columba casiotis*—EDS.

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and koklass, the "moonal" being too well known, as it is not infrequently seen adorning ladies' headgear or made into screens, etc.

The kalij (*Gennœus albicristatus*) known to the natives as the "cooquer" is a very handsome bird, the two sexes being quite distinct as to colouring. The male (as I have a fully grown young one before me, I will describe him), weight 2 lbs., back green, forehead black, feathers tipped with brown merging into a dull brown crest, the largest feather of which is 1⅝ in. long; the head and upper part of neck have not yet moulted, a red arc round the eye dotted over with tiny black feathers, the arc reaches from the ear to nostril; ear coverts black, lower part of neck wing coverts and over upper part of thorax metallic green, merging into feathers in which the metallic lustre is intensified and each feather having a white border about ¼ of an inch broad; this continues to the tail which is triangular in shape while the bird is at rest, the centre feathers tapering to a fine point and overlying the outer feathers; lower part of neck and chest ashy grey merging into feathers of a darker hue which cover the abdomen. The female has a general olive brown colouring and is also crested. These birds subsist chiefly on the seeds of various wild plants and shrubs, being very partial to the seeds of the wild dog-rose; they also devour grubs, caterpillars and the like.

The kalij, as a rule, lives lower down than the koklass and is a lover of dense cover, and is seldom found far from it, so that when alarmed he may plunge into it, and if pursued scuttles about like a hare turning and twisting and only taking to wing as a very last resort; the young birds of the year rise far more readily, and if they have previously not been molested by man usually perch in a tree emitting a whirring, scolding chuckle as they rise, and generally continuing it for a few moments after alighting. When once in a tree (they usually select the one with densest foliage near at hand) they remain immoveable until either dislodged by a stone, or the sportsman's or one of his assistant's eyes fall on him, and then knowing as if by magic that he is seen, he splutters out of the tree and dashes downwards, almost invariably alighting on the ground. When roused a second time even the young ones usually do not pitch in trees, but make off down the khud.

The old birds are wonderfully cunning in districts where they are at all shot at, instead of perching in a tree they often make off,

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straight down the khud, steering themselves dexterously between dense cover, or if they elect to perch, which they only do when flushed by a dog, they rise almost noiselessly, and take their departure in the same manner on the approach of man, giving a very difficult snapshot to the gunner, the only result from his point of view being the falling of a few twigs and leaves.

The koklass (*Pucrasia macrolopha*), a far more sporting bird than the kalij and weighing nearly half as much again, lives higher up where the Paludas grow (a species of pine tree, only growing at about 7,000 feet—at least I have not come across them lower down). They are very partial to the courses of streams and small plateaux on the sides of hills. They also live on berries and insects, but get a different variety of each in their more elevated haunts. The two sexes are very dissimilar, the cock-bird being even more handsome than the male kalij; both varieties are crested, but the crest of the adult male koklass is jet black, whereas the crest of the adult of the other is white, the general colouring below is silver grey merging into slatey grey on the back; head and upper part of the neck jet black with a white patch on each cheek. The hen is a much more homely looking bird, the general colouring brown with lighter shades on the under-surface, a sporting looking bird withal and more massive looking than her mate. In the shooting season, the old cocks are almost always found by themselves; the old hens may have their whole brood numbering usually 4 to 8 with them, or sometimes a single young bird, but are seldom solitary. The young birds are often found in couples. In shooting, if your dog puts up an old cock, do not trouble to look for any more birds near him, but if it be an old hen or a young one, make the dog range first above, where the first bird rose, then well to either side, and lastly below. I have never seen either these or the kalij run down hill for any distance.

Now for the description of a day's shooting, when fate was kind, one of the days on which all went well. There is a tremendous amount of luck in the sort of shooting I am about to describe, and a lot of hard work. About 4-30 A.M., I hear a voice which says: "sare char bajee," and it seldom has to be repeated for me at this time of the year, which is October, as previous shooting and prospecting seems to have sharpened my senses; possibly exercise has made my liver a few sizes smaller, hence I am less somnolent. It will not be light until 6 A.M.

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but I like to have plenty of time over a light breakfast, as I shall not eat again until 12 noon ; also there is a long tramp before the shooting ground is reached : 5-15, and I am ready for the khud side. My two companions for the day are a sturdy hill native and a little brown and white spaniel, the sort so common among the men in the British regiments in the Punjab. She was selected when six weeks old, and commenced her training shortly afterwards, and is now almost perfect as a gun dog. The brilliant moon which now lights our way as we scramble up a narrow hill-path was not in evidence when I retired to bed at 10-30 last evening, but now it is so bright that even under the trees we are not quite at a loss to follow the narrow path. The hill man goes first, as in spite of numerous tramps of this kind, I know the native of the soil will follow the main path much better than I can, and will lead me to our destination in spite of various cattle tracks that criss cross our road, which is after all only a rather larger cattle track. The average hill native has an eye for hilly country that the British-born ruler of the land will seldom equal in spite of much practice. It is not surprising, as most of us are brought up under widely different circumstances.

In the meantime, we have travelled a long way, and the stars in the East are paling and the moon begins to have a washed-out appearance ; however, we can take it easy now, as we are quite high up enough for the koklass. A few minutes later and the small birds begin to chirp and along the crest of the hill we are on, comes a resh breeze in fitful gusts, the usual harbinger of dawn at these altitudes. It will die away soon, and in fine weather the leaves hardly stir again until the evening. The breeze brings down a few brown and curled silver birch leaves, making one think of autumn, and I could wish many more of other kinds were down as well.

We push on a bit and reach a small plateau, the head of three nullahs, and now as the light grows stronger, every moment we sit down to listen, hoping to hear the prate, prate of the koklass somewhere below us, and shortly after the wail of the last marauding jackal has died away, far down in the valley below, we hear the longed-for sound, something like, only far softer than that emitted by the bazaar moorghi, when she is looking for a place to deposit her egg, not like the cackle she makes when it is laid. Now we must be as quick as possible, or this will be the only brood we shall hear calling. We

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hastily look round for the easiest way to them, and then the native beckons me and we make off. He well knows I wish him to keep wide of them until well beneath them, and then work up towards them. In ten minutes we are below them, then we proceed more cautiously down into the bed of the now dry torrent. Here I halt, and turning round, meet the bright questioning eyes of my little spaniel, no need to speak; a wave of the hand and she is off, going at full speed. She makes a cast 100 yards in front of us, and a little above, and then returns going at top speed all the time until reaching a ledge in the middle of the water-course, she suddenly stops and turns. A two seconds' examination of the ground with her nose, and up she goes straight up the nullah bed and is soon lost to sight amidst boulders and overhanging foliage. I hear nothing for a minute, and then yap, yap, with a peculiar intonation that I know means pheasant running ahead of me, as well as if she spoke. The next second there is a whirr of rushing wings, and out dash two birds almost simultaneously. They are straight above us, and must see us immediately they clear the tree-tops, but not a jot do they care, their object is the khud below us, and down they come, straight as a die, with outspread motionless wings. I shoot at the first far in front as I know from experience I shall have to turn my quickest to get a shot at the other. As I turn, the first bird hits a rock by my feet, the second bird was still clear of trees when I fired, but he disappears, but greatly to our surprise we see him again for a second as he tops the trees, moving straight upwards, and then turns over and falls with a crash. This is a bit of luck, for had he not towered we should have lost him. The spaniel has meantime rushed down to us, noses the bird near my feet, and then her eyes follow me. She hears the crash below and is off. I tell the native to follow, as it is far down, and the bird is large for her to carry; but she appears again in a few minutes and lays the bird at my feet, and then lies panting and wagging her tail. I whistle for the native and he returns, and picking up the birds makes his way after me, scrambling up the torrent bed. On reaching the place where the birds rose, I again wave the spaniel forward; she dashes hither and thither for a minute and is then off again towards the crest, and very soon there is another yap, yap, and I get a glimpse of a bird topping the trees and then just time for a snap as he swishes past me, this time between the trees. I cannot hear or see any result,



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but will look later, as the spaniel instead of returning to me remains above, giving a harsh woof every few seconds.

I know what that means well enough. One of the birds is sitting on the lower branches of a tree probably wondering why this funny looking new sort of jackal is behaving in such an unusual manner, and thinking everything is not as it should be, makes up his mind to join his companions below. I am warned by a flutter and the change in the dog's voice, but before I can get myself into position to shoot, the bird is past me and goes on its way rejoicing. Now, although it is a long way back I do not like leaving the third bird I shot at without having a look round, where he might have fallen, as I was pretty certain I was on him, when I pulled the trigger; so down we go again but all we find are two or three feathers, so we conclude that probably if he fell at all it was far down in the valley below, and I console myself by thinking if he is badly wounded he will make a good meal for some jackal to-night, and not be left long to linger in pain. The sun must be up by this time, but we cannot tell for certain here, as the nullah is on the north side of the ridge. We make our way over a ridge intending to enter the next small nullah, scarcely hoping now to hear birds calling as the time for this is nearly over. However, we are pleasantly surprised, and are soon off after another "snide," fortunately in a splendid place—a small plateau covered with bushes overhung by an almost perpendicular piece of khud.

On coming below the plateau, I rest for a minute for breath, and then push on waving the little bitch forward. These birds have evidently been running about all over the place, feeding, and the spainel clearly shows by her flashing stern, and eager movements that scent is abundant, but she finds a difficulty in hitting off the line. The next second she stops dead before a bush, looking over her shoulder at me, and at my nod dashes in and out, bundles a young koklass which rising ten yards from me makes off, but gets no further than the edge of the plateau, probably as easy a shot as one ever gets at a koklass.

The faithful spaniel retrieves the bird and then returns to the bushes, and after some feathering around, strikes a line for the steep khud side. Up and up she bounds, never missing her footing and never faltering. Now she is lost from view but a second or two later her voice is heard, and almost at once out hurry three birds; the first shot

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crumples up one as he comes towards me, the second is nearly overhead as I fire, and he goes on apparently unscathed. We clamber up by a circuitous route and arrive at the top of the ridge again and sit there for a minute wondering which will be the best way to go now as the sun is well up and there is no chance of hearing any more birds' calling. In the distance we hear the tap, tap of the woodman's axe, and soon a mighty crash denotes that some stately Paluda will no longer grace these mighty forests; but what is of more immediate interest following on the crash there rings out the cry of several male koklass far down in the valley below. The cry is far different to that of the bird found in English coverts. All the same, they respond to the same stimulus as their distant cousins in their western home; for who has not heard the cock-pheasants in a home covert set crowing by a sudden noise, such as the first clap of thunder of a storm.

This determines our way, so down we start until we come to a path my man knows of. The spaniel is encouraged to range chiefly above the path, as if she flushes any birds below they will most certainly escape unshot at. We work along round the valley, but although we know there must be birds somewhere, the little lady cannot find a scrap of scent until after a long search. On rounding a bend, she suddenly makes upwards, and I lose sight of her. A long wait, and then a distant yap; a minute later and a dark form is seen gliding downwards between the trees and curving away towards the side of the nullah. I fire as he comes, but the intervening branches are the only things at all injured, so I swing well ahead and fire again, but only realize as I press the trigger that the bird is putting on the brake hard with the intention of alighting on the side of the nullah. Down rushes the spaniel panting and exhausted, so I show her a pool of water in which she wallows for a moment and then jumps out refreshed and ready for anything, so I put her on the place where I last saw the pheasant, and without hesitation she dashes up and over a ridge dividing this from the next small nullah. I follow round below her hastily; three, four, five minutes pass, and I have visions of her lying beside a dead pheasant that she is too exhausted to carry; but not so; she again gives tongue, and again the wily old bird dashes down. I swing on to him, and continuing the swing, catch him in the open space between two trees, although at the moment of pulling the trigger I could not see

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him. What a handsome bird and what spurs! Even a game cock might have envied them.

On retracing our steps (this bird had gone back) I notice the rotting trunk of a tree with small pieces of the rotted wood scattered underneath it. I pause to examine it, and the hill man says that is what the pheasant was feeding on, and went further to explain that large insects bore holes in the rotten wood, and the pheasants dig them out and eat them. A further walk along the path and a stiff climb up to the ridge and another cock-pheasant is added to our bag, and yet another got away unshot at; there did not seem to be anything but solitary old cocks here.

Now for some light refreshment and a rest for a couple of hours in the shade, then I wake my slumbering companion, and we proceed plunging downwards through the jungle, reaching a well-worn path after an hour's tramp.

We have now left the haunts of the koklass. They seldom come as low as this in October, but we shall here find—nearer the haunts of man—the kalij; we can see the tin rooms of the Gali from whence we started, about five miles away in the distance, and we now wend our way in that direction hoping to pick up a kalij or two on the way. The khud here is broken up into a series of small nullahs separated by sharp ridges; in the nullahs the vegetation is dense and rank, while on the ridges there are only somewhat stunted fir trees, but the bareness is made up for by the ground being carpeted in places by the blue gentian which grows only on the bare ridges. We now come to a level piece of ground about an acre in extent, in which the forest officer has a nursery of deodars. Into these the little lady makes a dash, and during the next minute or two I am kept busy. Six birds rise almost simultaneously, one comes back towards me and the remainder make off for the khud side. I let go one barrel at the first-mentioned, but he passes on; so quickly swinging round the second barrel is directed at one just as he disappears behind a tree, a lot of leaves fall, and three or four feathers drift out on the breeze; my man following a hurried direction from me has made his way round and up the khud, as if he heads off the birds that have gone that way, one or two of the young ones may squat in the bushes between him and me. In the meantime two more birds rise and make off to join the rest, but I have got a bit more forward and on

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better terms with them. However, in stepping forward, one foot sinks into a hole, that was evidently intended for a young deodar, but not occupied. I raise myself on my knee and give the last bird a parting shot. He responds, crashing into a dense brake of wild raspberry and other bushes. The man above now shouts that a wounded bird has run past him, so I scramble up to where he is, getting severely scratched in the process. I put the bitch on the line, but she dashes over a ridge and I again hear her voice and the noise of wings faintly in the distance ; but nothing comes our way, so I whistle her back, scramble a hundred yards higher up than where the bird was last seen, and wave her into a thick tangle of bushes, where she very shortly strikes the right line, and after a tremendous hunt I twice see the bird that has evidently got the outer end of its wing broken—jump into the air to escape the dog. However, she at last catches him, and returns gleefully, as she loves catching a runner better than anything ; she places him at my feet and without a second's hesitation, he is up and off again ; so there follows another chase which ends sooner than the last, and this time I take good care to take the bird from her mouth.

It is no good looking for any of the birds that come this way now, so we retrace our steps, picking up the bird which had lodged in the brambles.

A little later on rounding a spur, a deep densely wooded nullah meets our view, the spaniel plunges into the undergrowth, and shortly after there is a very excited, prolonged yapping, very different to the short note she gives when after a pheasant. I, hoping it may be karker, scramble into a commanding position, and the next second 20 yards below me a male karker bounds into view. I aim well forward and fire, and shortly after hear a gurgling grunt, which tells me the shots have reached their mark. My man arrives on the scene before I do, and "halluls" the pretty little brown fellow. We then hang him up in a tree to be fetched later on and proceed. The sun is now rapidly sinking towards the summits of a distant range, so we hurry on a bit, and I, thinking we shall not find anything else now as this part is very much frequented by natives, unload my gun and hand it to my attendant ; but just before emerging on to the main road where I expect to find my pony, the spaniel makes a sudden rush up the khud, and two young kalijs rise ; one sits in a thick tree voci-

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ferating noisily, while the other alights not thirty yards off ; the one in the tree clatters out in response to a stone with a tremendous scolding and whirring. I account for him, and then put the dog on the other. He also rises into a tree, making as much noise as his brother. Unfortunately he departs from below me, but only goes about 40 yards the other side of the path and alights again. I follow, but again he moves, and this time he wings his way far down the khud, not giving me a chance. I pursue no further as the dusk is gathering fast, even young kalij are seldom as tame as this. I expect it is owing to their having lived near this frequented path.

We now emerge on to the main road, and I am glad to rest for a few minutes and empty the contents of my Thermos bottle (which the syce has brought) down my throat ; meanwhile the "pahari" lays the pheasants out in a row, and goes off to get two men to fetch the karker. I run my eye over the bag, noting the sexes, and as far as I can judge the ages of the birds. The first to attract attention are the two old cock koklass; no doubt about their not being this year's birds. I expect they are birds of 3 or 4 years' old, judging from their short sharp spurs. One of the remaining koklass is undoubtedly an old hen just over the moult. The end of her breast-bone hardly gives at all to pressure ; the remaining three koklass are birds of the year. The kalij are one forward young cock, one old hen, and one young hen. Such is what I would term at home my modest bag, nine pheasants and an animal smaller than a roe deer, but as shooting goes round a hill station, I am highly satisfied with my one gun, one man and one dog day !

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# A NEW BLIND SNAKE FROM THE WESTERN HIMALAYAS.

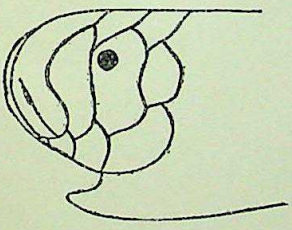
BY

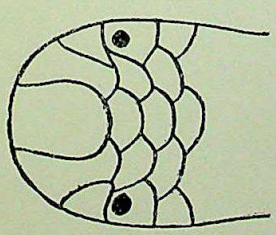
MAJOR F. WALL, I.M.S., C.M.Z.S.

*Typhlops mackinnoni.*

I have lately received from Mr. P. W. Mackinnon, Mussoorie (circa, 6,000 ft.), a single specimen of a blind snake hitherto undescribed which I propose to designate *Typhlops mackinnoni*. It was rescued from the clutches of a fowl which evidently intended to swallow it, but in spite of rough treatment is very little damaged.

Although the species has up till now escaped recognition, and is only known from this single specimen, I have good reason to believe that it is not uncommon. Five years ago whilst in Mussoorie, the site for a new building was being prepared near the library (circa, 7,000 ft.) necessitating deep and extensive disturbance of the soil. On one occasion I found the workmen had encountered two or three dozen blind snakes in their burrowing operations, and killed them. Most of these, though only some 6 to 8 inches long, were hopelessly mutilated, or cut up into several pieces, but I rescued three or four specimens in good preservation. These I put into spirit, but unfortunately being engaged in other work, set aside, and did not identify, and the bottle containing them was left behind when I packed up. I think it extremely probable that all these specimens were the same as that now described.





*Typhlops mackinnoni* (spec. nov.) (× 4).

*Description.*—Length 9⅝ inches. Snout rounded, and moderately projecting. Nostrils latera . Eye distinct. Diameter of body one forty-sixth the total length. *Lepidosis. Rostral.*—About one-third the breadth of the head, extending backwards to the level of the eyes. *Nasals.*—Nearly divided, the suture above the nostril fails to meet the rostral, the lower suture passes to the 2nd labial ; not meeting behind the rostral. *Præfrontal, Frontal, Interparietal,*

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*Supraoculars* and *Parietals* subequal and broader than the dorsal scales. *Præocular* nearly as large as the ocular, in contact with the 2nd and 3rd labials. *Ocular* in contact with 3rd and 4th labials. *Subocular* absent. *Temporal* single. *Labials* four. *Costals* in 19 rows (excluding the ventral row which is subequal to them, in size); decidedly broader than long. A spine at end of tail. *Colour*--Purplish-brown above, lighter below. Chin and mouth white.

It will be seen that the species most closely resembles *T. porrectus* but differs in that the rostral extends back to the level of the eyes, there is a short suture above the nostril and the diameter of the body is $\frac{1}{46}$ the total length (in *porrectus* it is $\frac{1}{70}$ to $\frac{1}{90}$).

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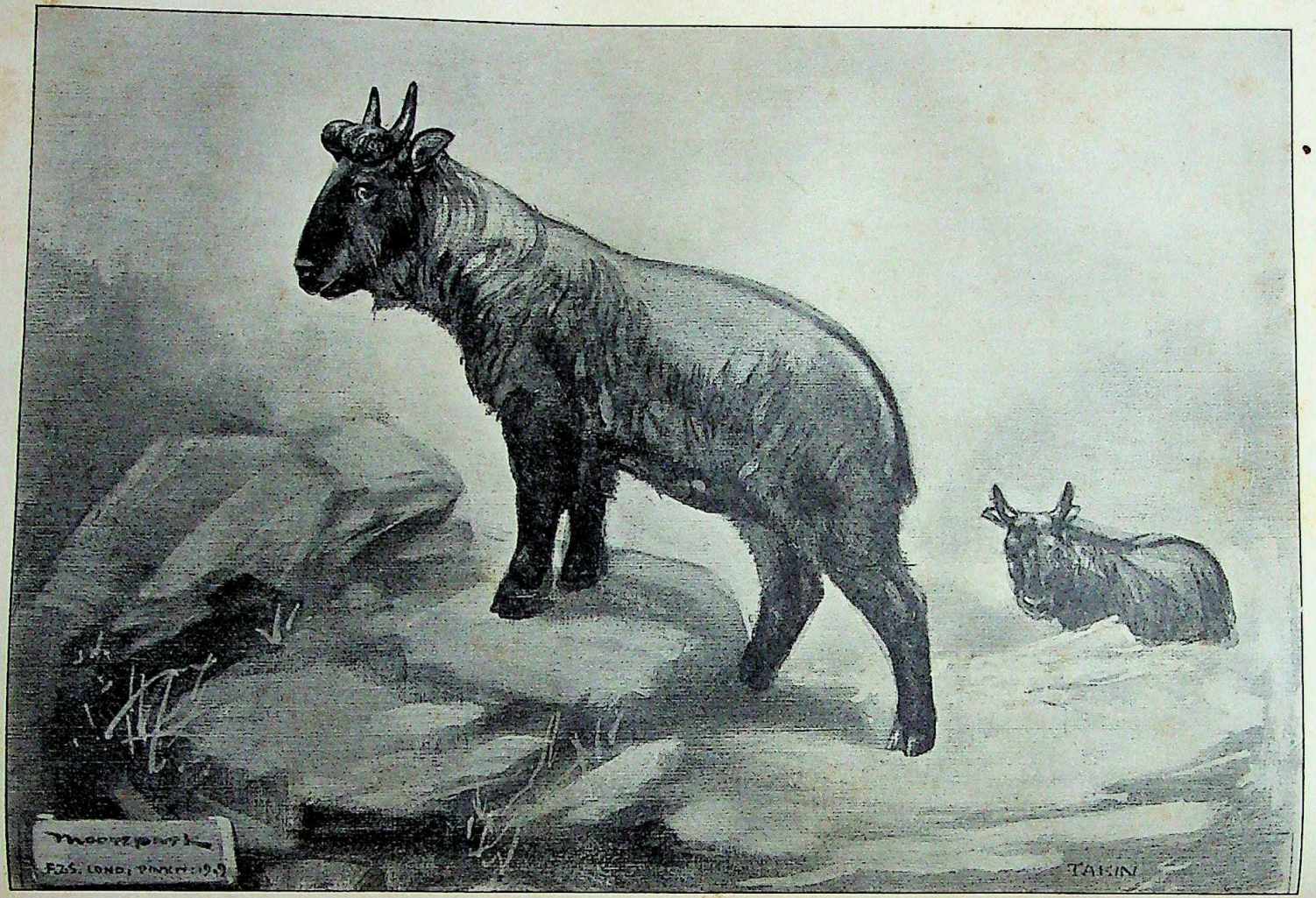


THE BHOTAN TAKIN (*Budorcas taxicolor*).

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# THE SEROWS, GORALS AND TAKINS OF BRITISH INDIA AND THE STRAITS SETTLEMENTS.

BY

R. I. Pocock, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens, London.

## Part I.—Introductory Remarks upon the Structural Characters of Serows, Gorals and Takins and Descriptions of the Known Species of Takins (*Budorcas*).

(*With* 2 *Plates.*)

Serows, Gorals and Takins are three well-marked genera belonging to a group of ruminant ungulates commonly called goat-antelopes from the intermediate position they are supposed to hold between goats and the anomalous assemblage known in popular rather than in scientific language as antelopes. Associated with these three forms are the chamois, which ranges from the Pyrenees to the Caucasus and the so-called Rocky Mountain Goat of North America. It is from the scientific name of the chamois, *Rupicapra*, that this group takes its designation of Rupicaprine Antelopes. Like most of the divisions of Bovidæ, the family containing the Sheep, Goats, Antelopes and Cattle, the Rupicaprinæ are not easy to define, except by the enumeration of a complex of positive and negative features which exclude them from the other divisions. Horns are present in both sexes and are only a little smaller in the females than in the males; they are finely, never coarsely, ridged and having no anterior or posterior crest, and are subcylindrical in section; typically they are short, and comparatively slender, and incline with a backward and more or less outward curvature over the occiput, but in the chamois they are erect, with an abrupt terminal hook. These characters break down more or less in the Takin, in which the horns in the adults are longer, very massive at the base and project at first outward from the side of the head, then form a sudden backward curvature. Nevertheless the horns in the Takin start as simple backwardly directed upgrowths and begin to bend outward and downwards at the base when they are comparable in relative sizes and shape to the horns of the Goral. They then may be said in their growth to go through the stage which persists in the Goral, just as the horns of the Cape Buffalo and of the Gnu pass through in their development a transitory stage which characterises the less specialised



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kind of horn in the ox tribe in the first instance and of other antelopes in the second instance. The fact that somewhat the same style of horns has been acquired by some Buffalos, by Gnus, by Takins and by Musk Oxen is forming conclusive evidence that the actual mode of growth in horns must not be regarded necessarily as a sign of kinship nor yet as a reason for considering species with different horn-growth as distantly related on that account.

Therefore, coming to the point that concerns us now, since the similarity between the horns of Takins and of Gnus cannot be held to be a sign of affinity between these two genera, so also it cannot in itself be regarded as a sign of affinity between Takins and Musk Oxen nor as a reason for separating Takins from Gorals. Hodgson, it may be added, long ago thought, that the shape of the horns in the Takins pointed to relationship between this animal and Gnus and Musk Oxen.

It is needless in a work of this description to compare Rupicaprinæ in detail with all the other sub-families of Bovidæ that have been instituted. Suffice it that they may be distinguished from the goats, Caprinæ, to which they are probably most nearly related by the absence of the anterior crest on the horns such as is seen in the Markhor (*Capra falconeri*) and the Thar (*Hemitragus jemlaicus*) and of the large knobs on the front of the horn observable in the Himalayan Ibex (*Capra sibirica*). For the rest the Rupicaprines have the ears long or short, narrow or wide. The tail is usually short, but in some Gorals is fairly long and furnished with a long terminal tuft. False hoofs are always present. In external form Serows and Gorals are very much alike apart from size, and no one would guess from their appearance how different they are in the structure of the skulls. Nor would anyone suppose from a comparison of the skins of living specimens that Gorals are not so very remote from Takins, judging from skull characters.

By external features the three would naturally be classified as follows :—

*a.* Body large and heavy ; legs thick and strong, especially the forelegs below the knee ; ears short with strong rounded upper rim ; summit of the muzzle above the nostrils hairy ; horns arising laterally

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bent slightly downwards, then sharply recurved, thickened at the base ... ... *Budorcas.*

*b.* Body strong but light; legs longer and thinner especially below the knee; ears long, much more pointed; summit of muzzle above the nostrils smooth and naked; horns arising on the top of the head and inclined backwards nearly parallel with each other in a direction a little inclined to the plane of the face, gradually narrowed from base to point.

*a*1. Smaller; no gland on the face in front of the eye ... ... ... ... ... *Nœmorhedus.*

*b*1. Larger; a distinct gland in front of the eye *Capricornis.*

By their skull characters the three genera may be arranged as follows:—

*a.* Maxillæ and lacrymals forming a long sutural union with the nasals which have a transverse lightly arched, not angular, and deeply emarginate suture with the frontals; lacrymals with a distinct and large pit; profile of skull viewed from above conical the upper rim of the orbits not concealing the zygomatic arch and no decided angulation of the maxilla above the molar teeth. Frontal region and horns as in the Goral (*Nœmorhedus*) ... ... ... ... ... *Capricornis.*

*b.* Maxillæ not forming a long sutural union with the nasals and almost a small portion of the lacrymal abutting against the nasals so that the angle formed between the maxillæ and the nasals is only remotely separated from the antero-lateral angle of the frontal the suture between the frontals and the nasals deeply and angularly emarginate; no deep depression on the lacrymal bone; skull when viewed from above much less conical in outline in the adult owing to the projection of

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the orbits which conceal the zygomatic arch and to the presence of a swelling on the maxilla above the molar teeth.

$a^1$. Frontal and parietal regions of the skull forming an evenly convex curve, the horns projecting backwards and upwards, nearly following the plane of the face and subparallel to each other ..... *Nœmorhedus*.

$b^1$. Frontal and parietal regions of the skull not forming a gentle curve, owing to the presence of a large upright long crest supporting the horns, which project laterally from its sides with a downward followed by a backward curvature ..... *Budorcas*.

It may be added that the deep-seated differences between the skulls of Serows (*Capricornis*) and Gorals (*Nœmorhedus*) are to a slight extent bridged over in the Japanese Serow named *Capricornulus crispus* in which only a very small area of the lacrymal touches the nasal, so that the antero-lateral angle of the frontal is not very remote from the upper edge of the maxilla. The latter, however, forms a long union with the nasal and the lacrymal is fitted as in the typical Serows.

A few words must now be added by way of explanation of the generic names adopted in this work. Owing partly to the introduction and sustained use of inadmissible names and partly to failure to appreciate the value of the structural differences between Serows and Gorals, there has been much needless confusion in the generic nomenclature of these two animals. The history of all this confusion would be too long to tell in a paper like the present, especially since I have already set it forth at some length in the Annals and Magazine of Natural History for February 1908. All that need be said is that originally Gorals and Serows were grouped together under *Nœmorhedus* by Hamilton, Smith, Hodgson and others. The first author to distinguish them by generic names was Ogilby in 1836, who called Serows *Capricornis* and Gorals *Kemas* and abolished *Nœmorhedus* which he had no power or right to do since by its original definition it must stand for one of them. Moreover, *Kemas* or rather *Cemas* had been previously employed for a section of ruminant

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Bovidæ which did not include the Gorals at all. Hence the name could not be applied to those animals. Quite wisely and reasonably, therefore, Gray, when he revised the group in a series of papers dating from 1843 to 1852, reserved *Capricornis* for the Serows and substituted *Nœmorhedus* for *Kemas* for the Gorals. Thus more than sixty years ago the names of these two genera were fixed in strict accordance with all the rules of nomenclature and common sense. A thousand pities was it therefore that Blanford, when writing his classic volume on the Mammals of India, put everything wrong again by ignoring Gray's decision and going back to the point from which this author started, namely to Ogilby. But recognising that *Nœmorhedus* must stand either for Serows or Gorals, he abolished *Capricornis*, used *Nœmorhedus* instead and reserved the inadmissible name *Cemas* for the Gorals. That Blanford's example was followed by most of his successors is not a surprising thing. But it was not followed by all for the question of the names was confused still further by Mr. Lydekker who in 1900 rightly dropped *Kemas* as inadmissible for the Gorals and wrongly vesiculated a name long consigned to oblivion, namely, *Mortragus*, which was given by Gray in 1871 to the Chinese Goral called *caudatus* by Milne Edwards, a species very closely allied to the one described in the following pages as *Nœmorhedus griseus*.*

These few words of introduction on the nomenclature of Serows and Gorals adopted in the following pages are, I think, rendered necessary by the fact that sportsmen and naturalists in India will otherwise be at a loss to understand the reasons for setting aside the nomenclature in Blanford's monograph and also in Mr. Lydekker's Great and Small

* Although I clearly pointed all this out early in 1908, my friend Mr. Lydekker still adheres to the modified version of Blanford's nomeclature he had adopted (see P.Z. S., Dec. 1908, p. 941) on the pretext that it was justified by duration of use. This argument, coming from the author who had substituted the practically unknown and never previously adopted name *Urotragus* for the familiar term *Kemas* is a little quaint. Moreover, although I should not admit that the argument had any validity, even if true, it happens to be demonstrably untrue. For *Capricornis* was used exclusively for the Serows in 1836, whereas *Nœmorhedus* was not used exclusively for them, so far as I have ascertained, until 1891. Even if, as I suspect, Mr. Lydekker relies upon "frequency" instead of "duration" all that I can say is that the statement may be true or false. I take it that Mr. Lydekker will no more attempt to substantiate it than I shall to disprove it by counting the number of times that *Capricornis* and *Nœmorhedus* have been applied exclusively to Serows in zoological literature; but I have a shrewd suspicion that *Capricornis* would come out a long way first since it was used over and over again, in the sense in which I have used it, by that most voluminous writer Père Heude in the nineties of the last century.

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Game of India, the two volumes to which they are most likely to have access for reference. In this paper, therefore, as in my previous ones, I follow Gray in calling the Serows *Capricornis* and the Gorals *Nœmorhedus*. With regard to the generic name *Budorcas* for the Takins there has happily been no difference of opinion amongst authors.

Genus *Budorcas*, Hodg.

Hodgson, Journ. Asiatic Soc., Bengal, xix, p. 65, pls. I—III, 1850; A. M. Edward's Rech. Mamm.

A large heavily built aberrant genus of "goat-antelopes" which by the structure of the skull seems to be an exaggeration rather of the Goral (*Nœmorhedus*) type than of the Serow (*Capricornis*) type. As in the Goral, for example, the face-gland is absent and the lacrymal bone has no pit for its lodgment. Moreover the upper portion of the maxilla between the upper end of the premaxilla and the lacrymal is much narrowed and forms no decided sutural union with the nasal, although almost in contact with it; the nasal itself projects fairly forward from its deeply emarginate suture with the frontal which is separated from the maxilla by a narrow space occupied by a piece of the lacrymal. In other particulars, however, the skull differs considerably not only from that of the Goral but also from that of the Serow, the differences being chiefly due to variations connected with the exceptional size and shape of the horn. Thus instead of forming a continuous curve with the frontal and occipital regions as in the other two genera mentioned, the area between the horns is elevated to form a stout, strong crest, which descends vertically behind them in the direction of the occipital ridge. From the sides of this crest arise the horns which are thickened and nearly in contact at the base where they move outwards, downwards (or forwards), then take an abrupt curve upwards (or backwards) in the same direction as the plane of the face. Viewed from above also the outline of the skull is more Goral-like than Serow-like owing to the prominence of the orbits making a constriction in front of them, and this is followed by another constriction of the maxilla just in front of the upper row of cheek teeth. The shape of the head follows that of the skull, the nasal region being high and erected and the mouth heavy with thick lips. The legs are remarkable for their stoutness, especially those of the front pair, the portion below the knees being exceptionally short and thick; the hoofs are broad and the

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false-hoofs large; the back is narrow and the abdomen full. The tail is short, broad and bushy. Although the resemblances in external form between Takins, and Serows is obscured by the great thickness of the legs, which are exceptionally short and stout below the knee in the Takins, nevertheless there is an unmistakable similarity between the two in attitude and general form. They stand straight up on the legs with the fetlocks and hoofs almost in line with the cannon bones above them. The head is carried normally with the neck nearly in line with the back, and the line of the back is broken by the slightly elevated withers and by the arch of the spine which rises in the middle of the back to about the height of the withers. From that point however the back slopes right away down to the root of the tail, the croup being very low and the tail set on nearly on a level with the lower edge of the neck when the latter projects forwards. This gives to the hind quarters a characteristic look of weakness which is enhanced by the "cow-hacked" appearance of the hind legs and by the suggestion of dragging about these limbs as the animal walks. Heavily built and entirely lacking the lightness of limb and body to which Serows and Gorals owe their activity, Takins are slow and deliberate in their movements and both ascend and descend rocks in a ponderous manner without any of the spring observable in mountain goats and antelopes. Those features, however, which, apart from the horns, detract most from their likeness to Serows and Gorals are the ears, which, instead of being long and as has been expressed donkey-like, are quite short and broad with a nearly semicircularly rounded upper rim and a much straighter lower rim. Finally the muzzle, instead of being bare, slimy and wet above, at least half way back to the corner of the nostril, is covered with short hair above, only the front of it and the area round the nostrils being naked. Almost exactly similar differences exist between the muzzles of yaks and others of the ox-tribe. It seems probable that the hairiness of the muzzle is associated in these two otherwise widely dissimilar ruminants, with life at high altitudes where the snow in winter has to be scraped away to get at the vegetation beneath.

The above given description of the shape of the Takin has been taken from observation of a living animal, the first brought alive to Europe, which was presented to the Zoological Society by Mr. Claude White, C.M.Z.S., through whose instrumentality it was procured in

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Bhotan. If the description be compared with some published plates representing the full figure of the animal a useful object lesson may be learnt regarding the futility of the efforts to depict the real appearance of an animal from a flat or mounted skin. For instance in the Proceedings of the Zoological Society, 1853, pl. XXXVI, Wolf represents a Takin as a noble looking beast, full of fire and spirit with a magnificently carried head, while in quite a recent number of the same periodical (1908, pl. XLIII), there is a figure of the animal which politeness permits one to describe as a ludicrous caricature. Very much better is Milne Edward's figure in his classic work Recherchers des Memiferès, pl. 74. Indeed so good in the main is this illustration that one cannot but surmise that it was taken from a sketch of the living animal submitted by Père David, its discoverer, to the French zoologist.

Young Takin sometimes differs considerably from the adult in colour. In the species described by Milne Edwards for example, namely *B. tibetanus*, while the adult bull is mostly a golden yellow and the cow grey, the young is fairly uniformly reddish brown, the pale tint being gradually acquired with growth. The heavy thick set build, however, is as manifest in the calf as in the full grown animal. The horns begin to arise, as in cattle, wide apart towards the angles of the forehead and grow upwards and slightly obliquely outwards for several inches before beginning to show traces of an outward bend at the base, which is the first indication of the curvature characteristic of the adult. This process was observed in the young Bhotan individual now living in the Zoological Gardens in London.

The two species of Takin that have been hitherto distinguished differ as follows :—

*a.* Head for the most part dark brown or blackish with no definite and isolated black patch on the nose below the eyes ; horns not distinctly ridged in the adult and showing an abrupt upward curvature ... ... ... ... *taxicolor.*

*b.* Head yellow or grey with a very definite and isolated black patch upon the nose below the eyes ; horns, sometimes at all events, distinctly ridged in the adult and more evenly and less angularly curved ... ... ... ... *tibetanus.*

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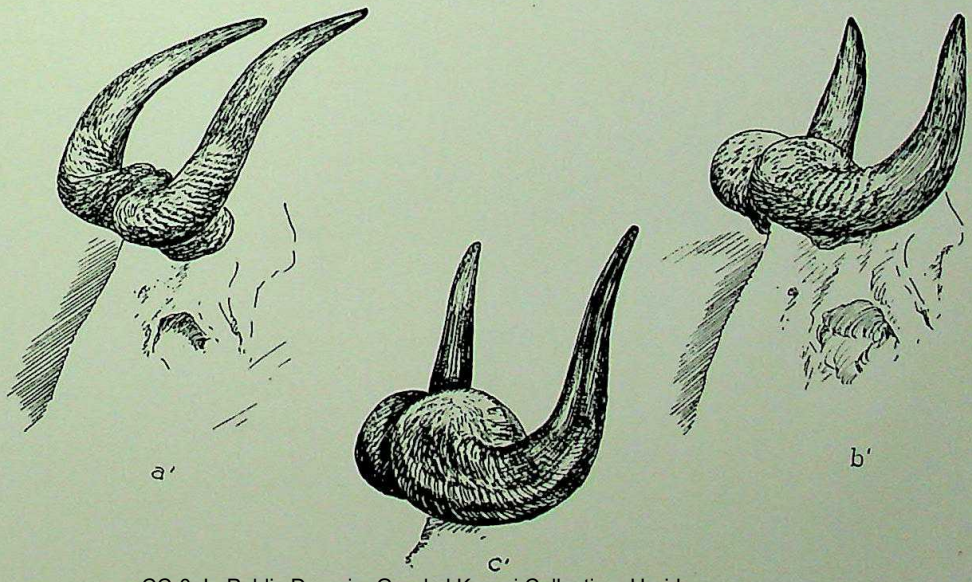
*Frontal and Side aspects of Horns of Takin*
*Sze-Chuen a-a' : Bhutan b-b' : Mishmi c-c'*

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*Budorcar taxicolor*, Hodgson.

Hodgson, Journ. Asiatic Society, Bengal, XIX, pp. 65-75, pls. I—III, 1850; Hume, Pro. Zool. Society, London, 1887, p. 485, figs. 1-3; Blanford, Mamm. British India, p. 515, 1891; Lydekker, Pro. Zool. Society, London, 1908, p. 796, fig. 168; and of other authors.

The colour of this species is evidently subject to a good deal of variation. According to Hodgson the entire body both above and at the sides is yellowish grey, thus suggesting the name "*taxicolor*" or badger-coloured; but the quantity of grey is variable, the whole animal being sometimes uniformly black owing to the absence of the grey, which results from the basal two-thirds of each hair being of a straw tint with the apical third black. The whole of the head and neck, the greater part of the belly, the tail and legs are black. It seems probable that the difference in the body-colour Hodgson points out is of a seasonal nature. The newly growing hairs showing only their apical third would give a black appearance to the pilage, but as the basal pale portion appeared gradually above the surface of the skin the colour would become at the same time more and more yellowish. This suggestion is borne out by Hume's account. He says the black or blackish heads are constant from kids to the largest males and females; but in some cases the body is yellowish dun, almost as in Milne Edward's plate of *B. tibetanus*, while in others it is deep reddish brown with a great deal of black intermingled, and sometimes intermediate shades occur. Hume adds that in his opinion these differences are not due to age or sex but to season. Both Hume and Hodgson agree that there is no sexual dimorphism in colour, the male and female being alike in this respect.

In the mounted male specimen in the British Museum the head as far back as a line lying behind the horns and ears is blackish brown; while the whole of the neck both above and at the sides, the withers and back half way down the sides and the croup are yellowish tawny or fawn, the tail, the outside of the thigh, the lower half of the body and of the shoulders, and the legs are blackish brown. There is in this specimen a dark spinal stripe extending from the occiput to the root of the tail; but whether the spinal stripe always extends as far forwards as in this example there is not sufficient evidence to show.



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The coat is thick and longish and clings to the body, being nowhere distinctly woolly. On the body it measures, according to Hodgson, from $1\frac{3}{4}$ to 2 inches in length and in the males it forms a distinct crest along the throat, about 3 inches in length, and grows on the gullet in the form of a beard, 5 or more inches long. The height at the shoulders, according to Hodgson, is 42 inches in the male and 36 inches in the female. In both sexes the length of the head from between the horns to the nose is rather less than half the height at the withers.

The horns vary considerably in length as the following table shows :—

| Length along Curve. | Basal Circumference. | Between Tips. | Sex. | Authority. |
|---|---|---|---|---|
| 25 | 13 | $11\frac{1}{2}$ | ♂ | Ward (largest recorded). |
| $24\frac{1}{2}$ | $12\frac{3}{4}$ | $12\frac{3}{4}$ | ♂ | |
| $22\frac{1}{2}$ | $13\frac{1}{2}$ | $10\frac{3}{4}$ | ♂ | Hume. |
| 22 | 13 | | | |
| 20 | 12 | 12 | ♂ | Hodgson. |
| $19\frac{3}{8}$ | 11 | 15 | ♂ | Ward (smallest recorded, but doubtful for the race). |
| $16\frac{1}{4}$ | 9 | $7\frac{1}{1}$ | ♀ | Hume. |
| 16 | $9\frac{1}{4}$ | | | |
| 16 | 10 | $8\frac{3}{4}$ | ♀ | |
| 16 | 10 | | | |
| $14\frac{1}{2}$ | $9\frac{1}{2}$ | $6\frac{1}{2}$ | ♀ | Hodgson. |

It must be added that the smallest horns recorded in the table above, as measured by Hume, were regarded by him as belonging to younger males than those of the larger size. There can, I think, be little doubt however that they belonged to females. Hume was evidently puzzled by the growth stages of the horns in this genus, for a frontlet he figured under the belief that it represented the horns of a fine old female, seems to have belonged to a subadult animal with the

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horns more widely separated at the base than in the other frontlets known to him and without the marked thickening on the brow and much less sharply recurved. Hume did not believe that horns of this type could be converted by growth into those of the other type ; but he was not aware that precisely analogous changes take place with growth in the horns of gnus (*Connochœtes*).

In his recent paper on Takins, published in 1908, Mr. Lydekker relied for particulars of Mishmi Hill species mainly upon a stuffed specimen in the British Museum, and did not apparently consult Hodgson and Hume for information as to the colour and other characters. He says, for example, that the precise shoulder height is not ascertainable, although Hodgson records it for both sexes. And one of the characters cited as distinguishing the Mishmi Hills species (*B. taxicolor*) from the Sze-chuen form (*B. tibetanus*) is the absence of distinct beard in the male of the former. Hodgson on the contrary expressly says that there is a distinct mane along the throat and a beard 5 inches long in the male, and this is shown not only in the plate accompanying his description but also in the plate by Wolf, published by Gray (Pro. Zool. Soc., Lond., pl. XXXVI). His description of the colour too applies only to one specimen and gives no idea of the variation with respect to this character upon which both Hodgson and Hume lay stress. Moreover, although he says the horns are stouter in *B. taxicolor* than is *B. tibetanus*, measurements given by Rowland Ward hardly substantiate the statement, as may be seen by comparing the dimensions of those horns of *B. tibetanus* recorded below with those of *B. taxicolor* mentioned above.

The two forms indeed are not nearly so distinct from one another as Mr. Lyddeker's descriptions would lead one to suppose, and it is quite possible that Milne Edwards was after all right in regarding them merely as local races of one and the same species.

As a local race of *Budorcas taxicolor*, Mr. Lydekker has recently described the Takin from Bhotan, naming it *B. taxicolor whitei* in honour of its discoverer, Mr. J. Claude White, C. M. G. (The Field, 1907, p. 887 ; Pro. Zool. Soc., London, 1908, p. 798, fig. 170). According to the describer the chief claim to distinction of this race rests upon the smaller size of the horns. In the skull of an old

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bull for example Mr. Lydekker judges that the horns would not have measured when unworn more than 15 or 16 inches along the curvature, whereas in the male of the typical form the length is from about 20 to 25 inches. As the skulls figured by Mr. Lydekker show, this difference in length depends upon the greater shortness of the basal horizontal position of the horn in the Bhotan as compared with the Assamese Takin rather than in the greater shortness of the recurved terminal portion. For instance in the skull of the Assamese Takin figured the extreme length of the basal horizontal portion is just about equal to the greatest inter-orbital width of the skull, whereas in the figured skull of the Bhotan specimen, the basal horizontal portion of the horn is markedly less than the inter-orbital width of the skull, this inter-orbital width being approximately the same in the two skulls. Skulls of young males and females of the Bhotan Takin are correspondingly smaller.

Unfortunately detailed comparison between the skulls of the two races was not possible. The two agree, however, in general coloration, in the darkness of the head and the extension of the spinal stripe from the occiput to the tail. In a young female presented to the Zoological Society by Mr. J. Claude White and now living in the Gardens in Regents Park, the coloration is practically the same as that of the adult bull of the Assamese species mounted in the British Museum—the specimen from which Mr. Lydekker's conception of the coloration of the typical form of *B. taxicolor* was derived—except that there is quite a considerable amount of yellowish brown hairs on the forehead and cheeks, so that there is no sharp line of demarcation between the colours of the head and the neck, such as is seen in the stuffed example in the British Museum. Whether this difference holds good in all cases it is impossible to say without further material wherewith to check it; but considering the great variation in colour exhibited by the typical Assamese Takin, it would be rash to assume constancy in all cases for the coloration of the head noticed up to the present time only in one young female specimen.

*Budorcas tibetanus*, A. M. Edwds.

*Budorcas taxiida tibetanus*, A. Milne Edwards, Rech. Mamm., p. 367, pls. 74-79, 1874.

*Budorcas sinensis*, Lydekker, in Rowland Ward's Records of Big Game, p. 350, 1907, and in Pro. Zool. Soc., London, 1908, p. 795.

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*Budorcas taxicolor mitchelli*, Lydekker, The Field, 1908, p. 790 ; *id.* Pro. Zool. Soc., London, 1908, p. 797.

*Budorcas tibetanus*, Lydekker, *loc cit*, p. 797.

Colour of the adult male a rich golden yellow in summer and grey in winter on the head, forequarters and over the greater part of the body, though clouded here and there with iron-grey, and passing into iron-grey or nearly black upon the limbs both externally and internally. Ears and tail blackish ; a large black patch covering the lower portion of the muzzle below the eyes. A dark spinal stripe extends backwards from the withers. The female resembles the male to a great extent, but instead of being golden yellow, the colour is decidedly grey. Overlooking the fact that Milne Edwards described the female as grey, Mr. Lydekker described the grey Sze-chuen Takin as a distinct race under the name *Budorcas taxicolor mitchelli*. It should be noticed that the figure of the type published by Milne Edwards represents the legs as black from above the knees and hoofs, whereas in the specimens in the British Museum above described they are iron-grey. There is, however, no properly localized material to show whether this difference has any systematic significance or not. A further point is this. The skull of the Sze-chuen Takin figured by Mr. Lydekker in 1908 (P. Z. S., 1909, fig. 169) is very different from the one shown in Milne Edward's work (pl. 77) ; the orbits especially and the angle of the maxilla being much more prominent. This, however, may perhaps be accounted for by the difference in age of the two animals, Milne Edward's being much the younger of the two. Lastly, Mr. Lydekker rightly says the horns of the examples of this species in the British Museum are more slender than in the Mishmi Hills species *B. taxicolor*. But the measurements given by Rowland Ward hardly support the view that the horns of all Chinese and Tibetan specimens are thinner than in Assamese examples.

The greatest circumference, for instance, in three specimens from Kansu in China and from Tibet, one of the latter being Pére David's specimen in the Paris Museum, are $11\frac{1}{2}$, $11\frac{1}{2}$, $12\frac{1}{4}$, whereas the much larger number of measurements taken from Assamese material show the average circumference to be somewhere between 11 and $12\frac{3}{4}$, one, perhaps a female, being $10\frac{5}{8}$ and only one reaching 13. Hence

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the difference is not very great, even if it exists at all—a fact which suggests that the specimen of *B. tibetanus* in the British Museum which Mr. Lydekker and I have described, would seem to be an example with exceptionally thin horns. The annexed figure of the frontlet and horns of this specimen shows not only that the horns are thinner, more arched and more distinctly ridged in *B. tibetanus* than in *B. taxicolor*, but that the skull itself is considerably narrower in proportion to its width in the former than in the latter.

The full measurements given by Ward are as follows :—

| Length along curve. | Basal circumference. | Between tips. | Locality. | Sex. |
|---|---|---|---|---|
| $20\frac{1}{2}$ | $11\frac{1}{2}$ | $11\frac{3}{4}$ | Kansu (China) ... | ♂ |
| $19\frac{3}{4}$ | $12\frac{1}{4}$ | $12\frac{1}{2}$ | Tibet ... ... | ♂ |
| $19\frac{3}{8}$ | $11\frac{1}{2}$ | $13\frac{3}{8}$ | ,, ... ... | ♂ |

The name *sinensis* which figures in the synonyms of *B. taxicolor* appears in print for the first time, so far as I know, in Rowland Ward's Records of Big Game, 1907. Since it is there accompanied by measurements, the name must stand if the Takin from the locality mentioned, namely Kansu in China, proves to be racially separable from the one Milne Edwards described. Mr. Lydekker, however, says that the example in the Tring Museum to which the name *sinensis* was first applied is identical with the Sze-chuen specimens he saw described and figured in 1908. If this be so, and if the differences above mentioned that undeniably subsist between the figures and descriptions of the animals described respectively by Milne Edwards and Mr. Lydekker turn out to be of systematic importance, sufficient to justify nominal recognition, the name *sinensis* will have to be retained for those specimens examined by Mr. Lydekker which were shot by Mr. Brooks in Sze-chuen and are now exhibited in the British Museum, as well as for the type in the Tring Museum from Kansa.

According to Milne Edwards the young of this species is brownish red and gradually assumes the pale tint of the adult with advancing years.

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These Takins live in Sze-chuen on very steep and wooded slopes of the highest mountains and only leave them at night to feed. In winter they ascend to the very elevated and treeless summits where coarse dry grass is found in abundance on the slopes exposed to the sun. Although usually found alone or in small troops, it seems that in June they collect together in larger numbers. The voice is a deep bugle-like note, and the alarm cry is a loud whistle through the nose.

पुस्तकालय
४८९१५
विश्वविद्यालय

(*To be continued.*)

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# NOTE ON THE SEROW (*NŒMORHEDUS BUBALINUS*) *FROM THE CHUMBI VALLEY.*

BY

CAPTAIN F. M. BAILEY.

(*With a Plate.*)

The three photographs of Serows on Plate B were taken in the Chumbi Valley where the animal is not uncommon.

No. 1 is of a young animal captured on 16th July 1908. I was only able to keep it in captivity for a short time as it escaped. Nos. 2 and 3 are of an adult male captured on the 22nd April this year. This animal only lived for two days and was very wild and dangerous, making sudden rushes at any one who approached, and striking with his horns which were very sharp. The photographs show the characteristic attitude which this animal adopts; the legs appear to be sprawling about, the clefts in the hoofs are much opened, and the head is thrust forward with the horns lying back along the neck. The skin and skull of the animal in the photograph has been given to the Edinburgh Museum and a description of it by Mr. Pocock, F.Z.S., is to appear in this journal. The following are the measurements of this specimen :—Head and body 52″. Tail without end hairs 4½″, ear 6½″, height at shoulder 34″.

On the 26th June 1907 an adult female was captured, which I was able to keep for about a fortnight, after which she died when giving birth to a single young one. This animal although it would eat from the hand was also very dangerous, and it was unsafe to approach within reach of its tether. The three Serows mentioned above were captured at an altitude of about 10,000 feet. The Tibetan name for the Serow is "Gya-ra."

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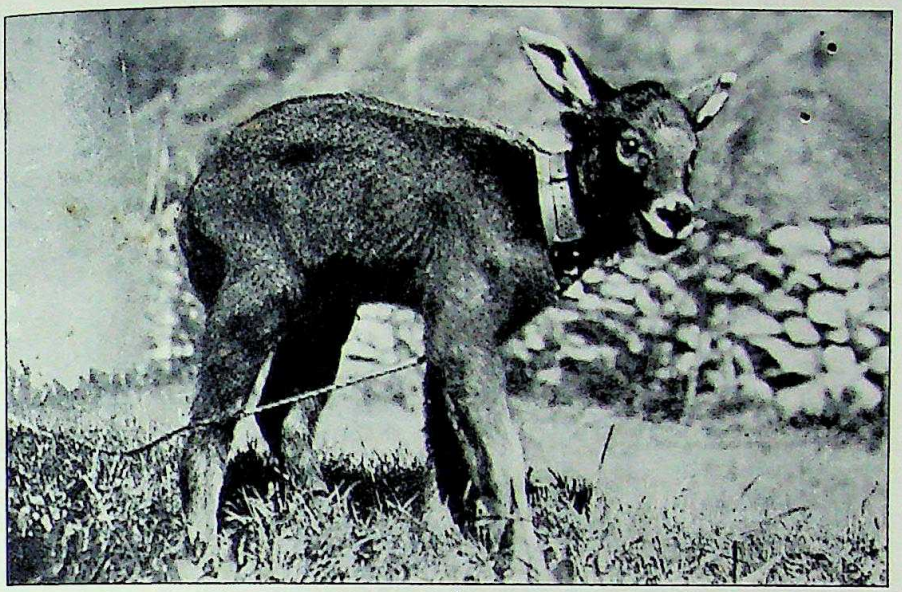

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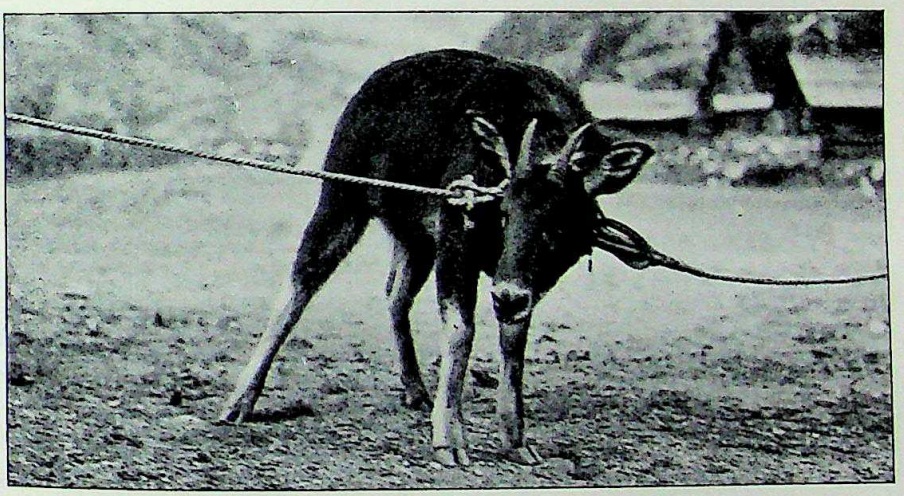

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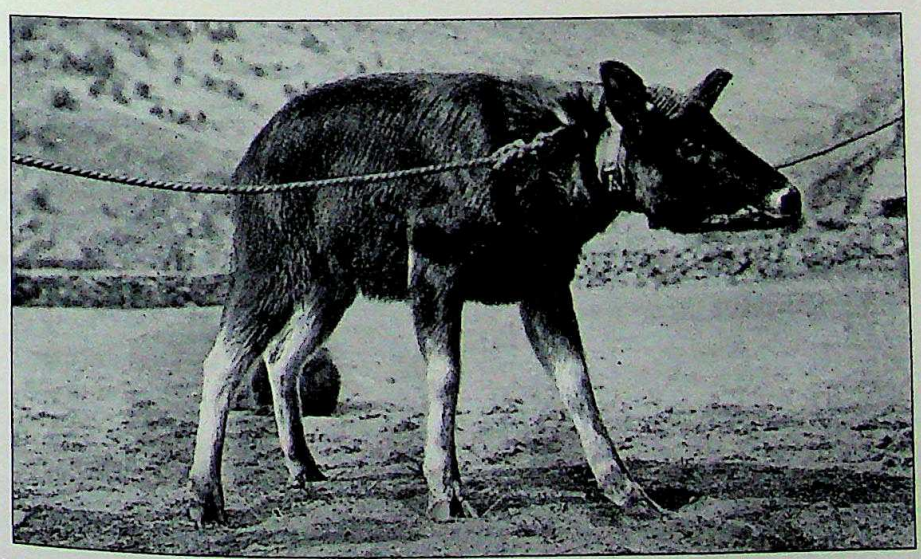

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THE HIMALAYAN GOAT-ANTELOPE OR SEROW *(Nemorhædus bubalinus)*.

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# NOTE UPON THE SKIN AND SKULL OF A SEROW OBTAINED BY CAPT. F. BAILEY AT CHUMBI IN TIBET.

BY

R. I. Pocock, F.L.S., F.Z.S.,

*Superintendent of the Zoological Society's Gardens, London.*

At the request of Mr. W. S. Millard and of Capt. F. Bailey I examined, at Rowland Ward's in Piccadilly, the skin and skull of a Serow obtained by Capt. Bailey at Chumbi near Sikkim, at an altitude of 10,000 feet, and now, I understand, exhibited in the Edinburgh Museum. Although the animal appears to me to belong to the same race of Serows as the form described by Hodgson from Nepal as *Antilope thar*, remains of Serows so seldom come to hand for examination that I think a descriptive note of the characters of this animal is worth publishing. I may add that there is an example of Serow in the British Museum from Sikkim which was procured by Dr. Blanford. This animal was correctly identified by Blanford with Hodgson's species and presents practically the same features as Capt. Bailey's example, except that the belly is not white along the middle line. I have reason to think this difference may be a matter of age.

According to the paper I recently wrote upon the Serows of the Himalayas and Straits Settlements, Capt. Bailey's specimen should be called *Capricornis Sumatraensis thar*; or if any one prefers to regard the Himalayan Serows as specifically distinct from Sumatran and Malaccan Serows, it may be called more shortly *Capricornis thar*.

Prevailing colour black on the head, neck and body, the basal portion of the hairs on the body and the posterior part of the mane white, towards the belly and on the outerside of the thighs the black passes gradually into rufous brown; a brownish tinge on the backs of the ears and on the sides of the upper lip. The front of the upper lip and the chin white; the white of the chin passing a short distance back along the lower edge of the jaw but not continued nearly as far as the throat patch which consists of a pair of white spots. The black on the shoulders is continued down the outerside of the foreleg nearly to the knee. Similarly the rufous black hue of the outerside of the thigh up to the root of the tail extends down the outerside of the hind-leg to the hock. The legs below the knees and hocks both outside and inside are dirty white; on the hind leg the white of the innerside extends upwards to the groin and involves also the front of the leg below the stifle (knee) joint; innerside of foreleg also whitish up to the breast. Middle line of belly and chest and the whorls of hair on the breast white. Tail black with some grey hair.

Capt. Bailey has kindly supplied me with the following dimensions of the animal before it was skinned:—

| | | | | |
|---|---|---|---|---|
| Height at shoulder | ... | ... | ... | 34 inches. |
| Length of body and head | ... | ... | ... | 52 „ |



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Length of tail (without end hair) ... ... 4½ inches.
Length of ear ... ... ... ... ... 6½ „

Skull belonging to the low, flattish type characteristic of Nepalese Serows, owing to the transverse and longitudinal flatness of the frontal bones above the orbits. The following are some of its dimensions in millimetres (25 mm. = 1 inch) as compared with those of a skull from Nepal :—

| | Chumbi. | Nepal. |
|---|---|---|
| Length from basi-occipital suture to top of premaxillæ ... | 235 | 241 |
| Width across zygomata ... ... ... ... ... | 118 | 128 |
| „ „ maxillæ ... ... ... ... ... | 87 | 98 |
| „ between orbits ... ... ... ... ... | 75 | 87 |
| Length of frontals along middle line ... ... ... | 105 | 105 |
| „ of nasals along middle line ... ... ... ... | 88 | 93 |
| Width across nasals ... ... ... ... ... ... | 40 | 47 |
| „ „ premaxillæ (maximum) ... ... ... | 50 | 51 |
| Height from alveolus of molar$^2$ to top of frontal .. ... | 90 | 94 |
| „ „ „ premolar$^3$ to top of nasal ... | 78 | 84 |
| Length of cheek teeth .. ... ... .. ... | 94 | 87 |
| Median length of palate ... ... ... ... .. | 164 | 167 |
| Width of palate between last molar ... ... ... | 55 | 52 |
| „ „ „ front premolars ... ... ... | 34 | 38 |
| Width of last molar ... ... ... ... ... ... | 13 | 16 |
| Length „ „ ... ... ... ... ... ... | 20 | 20 |

The horns measure 185 mm. (= 7¼ inches) in length and 120 mm. (= 4¾ inches) in basal circumference.

These measurements show certain differences between the two skulls, but only such as are I think attributable to individual variation or to age. Thus the greater length of the cheek-teeth in the Chumbi specimen which is smaller in almost all respects than the Nepal example is I believe a matter of age. Again it will be noticed that although the posterior width of the palate is greater in the smaller skull, the width of the last molar is correspondingly less, so that the measurement taken to include the molars is almost the same in the two, the truth I think being that the molar increases in width up to a certain point of course with age and the palate correspondingly decreases in width. The flatness of the skull above alluded to is well shown by the measurements taken from the alveoli of $m^2$ and $pm^3$ to the summit of the frontals and nasals in a vertical line above them. If these be compared with similar measurements yielded by a skull of Rodon's Serow from Chamba in the Punjab and of the Kashmir Serow from Pir Punjab (see my paper, P. Z. S., 1908, p. 189) the value of the difference will be appreciated.

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# NOTES ON SNAKES COLLECTED IN UPPER ASSAM.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

PART II. (WITH A PLATE.)

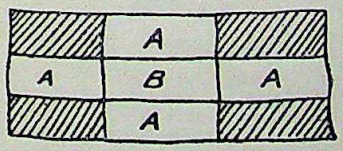
*(Continued from page 623 of this Volume.)*

*Coluber prasinus* (Blyth).

I had one specimen sent to me from near Jaipur (Namsang).* The ventrals and subcaudals were 191+102. Anal divided. The scales were 19 anteriorly and in midbody, 15 at a point, two head-lengths before the anus.

*Coluber radiatus* (Schlegel).

One killed by some Assamese boatmen was called by them "goom phitti". I collected 41 specimens, of which 11 were from Sadiya, 2 from near Doom Dooma, and the rest from Dibrugarh. Of 25 specimens sexed 18 were ♀ and 7 ♂. My largest were ♀ 6′-0⅝″, and ♂ 6′-0″. Not only is the colour of the scales remarkable in this snake, but also that of the skin. The head in life is usually a copper colour, or a hue not unlike that of dried orange peel, and this merges to a duller tone on or close to the neck. Anteriorly the body is adorned with black longitudinal stripes, usually three in number on each side, and progressively narrowing from above downwards; the lowest often interrupted. In a slough I found I noticed that these black marks were faintly visible. The skin at this situation is chequered as shown diagrammatically in the attached figure. The shaded squares are pitch black, squares A are a pale blue-grey, and square B bright yellow.




The effect is very striking. The tips of the tongue are black. On the 27th April two were reported as having been seen in company playing together. One, the ♀, was killed and proved to be gravid, the eggs being nearly matured. This is yet another instance of the conjugal attachment of snakes, which has come to my knowledge of recent years. The secretion of the anal glands is ochraceous in colour.

One specimen brought in was bleeding profusely from the mouth

* See remarks on this locality under *Trachischium monticola*.

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nd on investigation I found two black leeches in the oral cavity. This snake takes readily to water, and on one occasion my wife and I watched a large one swimming the river towards us. It breasted the current and though a strong flood was flowing, kept its position very well, facing obliquely up stream, and making for a tangle of bush. On another occasion a gentleman watched one swimming towards his boat from across the river, and when confronted by the boatmen, it proceeded to contest the right of way, and by its truculence lost its life. My informant said that when it landed it raised itself, and expanded the neck in a contrary direction to that of the cobra, and was very strikingly handsome. It is infested with the same parasite that afflicts the *Tropidonotus piscator* and *stolatus*, *i.e.*, the larval tapeworm (*Pterocercus* sp.).

Other events etc., of interest are as follows :—

| Date. | Sex. | Length. | Tail. | Ventrals | Subcaudals. | Remarks. |
|---|---|---|---|---|---|---|
| 1907 | | | | | | |
| April 26th ... | .. | 1′ 7⅓″ | .. | .. | .. | |
| „ 27th | ♀ | 5′-1″ | 11¼″ | 24 | 87 | Contained 5 eggs (4+1) $1\frac{1}{16}'' \times \frac{14}{32}$. |
| May 2nd | ♂ | 4′ 9″ | 11¼″ | 229 | 88 | Killed in native house. |
| „ 11th | ♀ | 5′-2½″ | 12″ | 233 | 94 | |
| „ 16th | ♀ | 4′ 4″ | ... | 248 | ... | Tail imperfect. Contained 5 eggs (4+2), $1\frac{15}{32}'' + \frac{14}{32}''$. |
| „ 24th | ♀ | 3′-9½″ | 8½″ | 248 | 83 | |
| June 3rd | ♀ | 4′-7¼″ | 10⅜″ | 247 | 83 | |
| „ 3rd | ♀ | 4′-10½″ | 1′-0″ | ... | ... | |
| „ 8th | ♂ | 4′ 5″ | ... | ... | .. | |
| „ 11th | ♂ | 4′-1½″ | 9¼″ | 231 | 88 | |
| „ 16th | ♀ | 4′-5¾″ | ... | | .. | Tail incomplete Contained 7 eggs $1\frac{1}{2}'' \times \frac{12}{32}''$. |
| „ 26th | ♀ | 5′-3″ | 1′-0″ | 246 | 94 | Contained 9 eggs, 2″ to 2¼″ long. |
| „ 27th | ♂ | 5′-3″ | ... | .. | ... | |
| July 12th ... | ♂ | 5′-2″ | 1′-0½″ | 228 | 89 | |

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| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Remarks. |
|---|---|---|---|---|---|---|
| 1907. | | | | | | |
| July 26th . | ♂ | 4′-11½″ | 11⅛″ | 244 | 92 | |
| Oct. 27th . | ♂ | 6′-0″ | 1′-1″ | ... | ... | |
| „ 28th . | ♀ | 5′-6¼″ | 1′-0½″ | 250 | 89 | |
| 1908. | | | | | | |
| Feb. 16th . | ♀ | 5′-0½″ | 11⅝″ | 240 | 85 | |
| „ 18th . | ♂ | 5′-0⅝″ | 11⅛″ | 236 | 88 | |
| March 26th . | ♀ | 5′-10½″ | ... | ... | ... | |
| April 13th . | ♀ | 6′-0⅝″ | 1′-1⅛″ | ... | ... | Contained 12 eggs $\frac{13}{16}$″ × $\frac{5}{16}$″ |
| May 21st . | ♀ | 5′-0½″ | | ... | ... | Tail incomplete. Contained 8 eggs 1¾″ long The first and last 2 $\frac{1}{16}$″ long. |
| Oct. 22nd . | ♂ | 5′-7″ | ... | ... | ... | Killed in a stable. Hair of a small mammal in the stomach. |

*Coluber porphyraceus* (Cantor).

Two specimens; one from Sadiya and one from Namsang, near Jaipur. Both quite typical.

*Dendrophis pictus* (Gmelin).

I obtained one ♀ specimen of what I think there can be no doubt is this species. The anal is divided, the ventrals 195, and costals 15 anteriorly and in midbody, 9 behind at a point two heads-lengths before the vent.

*Dendrophis proarchos* (spec. nov.)

I collected 24 specimens of a snake of this genus which is certainly entitled to rank as a distinct species hitherto not described. With the exception of one from Sadiya, one from North Lakhimpur (Dejoo) and one from near Doom Dooma, all were obtained around Dibrugarh.

The species is extremely like *pictus*, but differs in having the anal shield entire and in the dentition. In no other species of this or the nearly allied genus *Dendrelaphis* is the anal undivided. I have prepared two skulls and the dentition is as follows. *Maxillary* 27 to 28 teeth,

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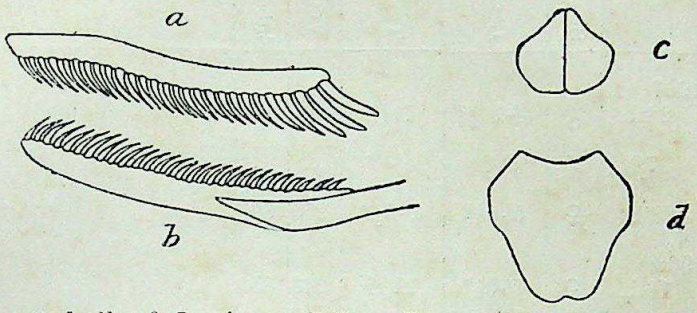
the last 3 very distinctly enlarged, even I think more so than in *pictus*. *Palatine* 15 to 16. *Pterygoid* 24 to 27. *Mandibular* 25 to 28.




I have 3 skulls of *D. pictus*, all from Eastern Himalayan specimens. In these the *maxillary* teeth are 20 to 21, the *palatine* 13 to 14, the *pterygoid* 21 to 26, and the *mandibular* 21 to 22. From these data it will be seen that *proarchos* differs very considerably from *pictus*, especially as regards the *maxillary* and *mandibular* teeth. I tabulate the specimens as follows:—

| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Scales | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2 heads-lengths behind head. | Midbody. | 2 heads-lengths before vent. | |
| 1907 | | | | | | | | | |
| May 4th. | ♀ | 3′-3¾″ | 1′-1⅜″ | 190 | 143 | 15 | 15 | 9 | On the roof of a house. |
| „ 20th. | ♀ | ... | ... | .. | .. | 15 | 15 | 9 | |
| „ 22nd. | ♀ | 3′-9¼″ | 1′-3″ | 192 | 141 | 15 | 15 | 9 | |
| „ 22nd. | ♂ | 3′-1 ″ | 1′-1¼″ | 185 | 149 | ... | ... | ... | |
| „ 27th. | ♀ | 3′-8¾″ | 1′-3″ | ? | 141 | 15 | 15 | 9 | Contained 7 eggs, 1¼″ to 1$\frac{20}{32}$″. |
| „ 29th. | ♂ | 3′-5¼″ | 1′-3″ | 184 | 153 | 15 | 15 | 9 | |
| „ 29th. | ♀ | 3′-11½″ | 1′-4″ | 188 | 146 | 15 | 15 | 9 | |
| June 1st. | ♂ | 1′-5¾″ | 0′-5⅝″ | ... | .. | 15 | 15 | 9 | |
| „ 1st. | ... | ... | ... | ... | ... | 15 | 15 | 9 | Tail imperfect. A gecko in the stomach. Contained 8 eggs, $\frac{21}{32}$″ to $\frac{29}{32}$″ long. |
| „ 15th | ♀ | 4′-0½″ | 1′-3½″ | ... | ... | 15 | 15 | 9 | |
| „ 16th. | ♂ | 3′-3″ | ... | ... | ... | ... | ... | ... | |

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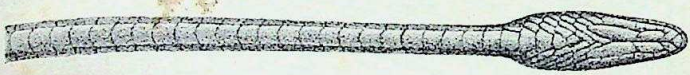

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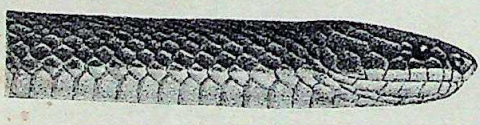

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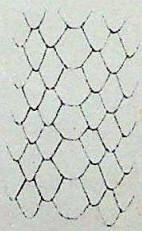

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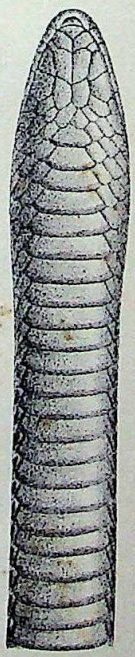

6.

J. Green del. et lith.

1-3. Dendrophis gorei. 4-7. Bungarus niger. 8. B. lividus.

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| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Scales. 2 heads-lengths behind head. | Scales. Midbody. | Scales. 2 heads-lengths before vent. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| 1907. | | | | | | | | | |
| Oct. 14th. | ♂ | 1′-11¼″ | 1′-0⅜″ | 188 | 148 | 15 | 15 | 9 | |
| „ 25th. | ♀ | 4′-0⅝″ | 1′-3⅞″ | 193 | ... | 15 | 15 | 9 | Tail slightly imperfect. |
| 1908. | | | | | | | | | |
| Feb 16th. | ♀ | 3′-4 ″ | 1′-1⅛″ | 195 | 142 | 15 | 15 | 9 | 3 postoculars on both sides. |
| Mar. 11th. | ♂ | 3′-7¼″ | 1′-2⅜″ | 186 | 143 | 15 | 15 | 9 | |
| „ 25th. | ♂ | ... | ... | 187 | ... | 15 | 15 | 9 | Tail incomplete. |
| April 13th. | ♂ | 2′-8½″ | 0′-9¾″ | ... | ... | 15 | 15 | 9 | |
| May 8th... | ♀ | 2′-10½″ | 0′-11⅛″ | ... | ... | 15 | 15 | 9 | |
| Sept. 22nd. | ♀ | ... | ... | 192 | ... | 15 | 15 | 9 | Tail incomplete. |
| Oct. 24th. | ♂ | ... | ... | 187 | ... | 15 | 15 | 9 | |

*Dendrophis gorei* (spec. nov.)

(Figs. 1 to 3 of Plate).

I acquired two specimens of a new species of Dendrophis. One of the types I sent to the British and the other to the Indian Museum. The first specimen I had sent to me by Mr. C. Gore from Jaipur (Namsang).* It was a ♀, measuring 2 feet 8½ inches, the tail accounting for 10½ inches. The second was from near Dibrugarh (Atabari), and was 2 feet 4½ inches, the tail (8 inches) being imperfect. I found a gecko in the stomach.

*Description.—Rostral.*—Touches 6 shields, the rostro-internasal and rostro-nasal sutures subequal, and about twice the rostro-labial. *Internasals.*—Two; the suture between them ¾ to ⅘, that between the præfrontal fellows, ¾ to equal to the internaso-præfrontals. *Praefrontal.*—Two; the suture between them rather greater than the præfronto-frontal; in contact with the internasals, postnasal, loreal, præocular, supraocular and frontal. *Frontals*—Touches 6 shields; the

* For remarks on this locality see *Trachischium monticola.*

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frônto-supraoculars more than twice the fronto-parietals. *Supraoculars.*—As long as and rather broader than the frontal along a line connecting the centres of the eyes. *Nasals.*—Divided; subequal; in contact with the 1st and 2nd supralabials. *Loreals.*—One; as long as the two nasals. *Præoculars.*—One, nearly touching the frontal. *Eye.*—Large, equals its distance to the anterior edge of the nostril. *Postoculars.*—Two. *Temporals.*—One anterior. *Supralabials.*—8, the 4th and 5th touching the eye. *Infralabials.*—6, the 6th very long, equalling the 4 preceding shields taken together; in contact with 2 scales behind. *Sublinguals.*—Two pairs, the posterior longer than the anterior; and in contact with the 5th and 6th infralabials. *Ventrals.*—193 to 199. *Anal.*—Divided. *Subcaudals.*—132? (perhaps very slightly docked). *Costals.*—Two heads-lengths behind the head 13, midbody 13, two heads-lengths before the anus 11. The rows reduce to 11 by a coalescence of the 4th and 5th rows above the ventrals. *Vertebrals.*—Very well developed, as broad as long in midbody, as broad or broader than the last row. *Body.*—Cylindrical. *Colour.*—Very like *pictus.* Dorsally bronze-brown ending abruptly in the middle of the penultimate row, the overlapped margins of the scales a bright sky-blue. A lighter vertebral stripe. Belly, ultimate and lower half of penultimate rows greenish opalescent. Head ruddy-brown above with a well defined black postocular streak continued on to the forebody. Lips and chin greenish-opalescent. *Dentition.*—For fear of damaging the specimens, I only investigated the maxillary teeth. I counted 20 on the right side, the last 2 or 3 of which appeared to be slightly longest.

*Dendrelaphis biloreatus* (Wall).

The type specimen, the only one collected, came from Sadiya, and was described and figured in this Journal (Vol. XVIII, p. 273). It is now in the British Museum.

*Simotes albocinctus* (Cantor).

Nine specimens came to hag. Three were from near Dibrugarh (Maijan and Greenwood Estates), one from North Lakimpur (Dejoo), one from near Tinsukia, three from Sadiya, and one from near Jaipur (Namsang), all of these belonged to variety *typica* (A of Boulenger's Catalogue). In the Jaipur specimen the subcaudals were 47, in the one from Dejoo 49, and in the one from Maijan 50 (Boulenger 51 to 69). A ♀ measuring 2 feet 5¼ inches (the tail imperfect 4 inches)

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was gravid on the 10th of July and contained 3 eggs. The supralabials were 8, the 4th and 5th touching the eye in one specimen.

*Simotes violaceus* (Cantor).

Only two examples were obtained, one from near Tinsukia, and one from near Halem (Baroi). Both belong to variety D of Boulenger's Catalogue (Vol. II, page 223). In both the ventrals and subcaudals were 177 + 31 (Boulenger: subcaudals 33 to 41). In one there was a small median prefrontal.

*Oligodon dorsalis* (Gray).

A single specimen was sent me by Mr. Gore from Namsang, W. Jaipur. This was a ♀ 12⅝ inches long, the tail being 1½ inches. The ventrals were 173 and the subcaudals 29. The scales two heads-lengths behind the head were 15, in midbody 15, and two heads-lengths before the anus 13, as is usual in this species.

SUB-FAMILY—HOMALOPSINÆ.

*Hypsirhina enhydris* (Schneider).

One specimen from Dibrugarh was brought in to me, a ♂ 1 foot 10 inches long, the tail 5¼ inches. It agrees with variety B of Boulenger's Catalogue* (Vol. III, p. 7). The ventrals and subcaudals were 153 + 74. The costals were in 23 rows at a point two heads-lengths behind the head, 21 in midbody, and 20 at a point two heads-lengths before the anus. The 3rd and 4th rows above the ventrals blended at both steps reducing the rows from 23 to 19.

SUB-FAMILY—DIPSADOMORPHINÆ.

*Dipsadomorphus gokool* (Gray).

I got four examples of this uncommon snake, three in Dibrugarh, and one from North Lakimpur (Dejoo). One of these was brought alive, and behaved just like others of the genus with which I am acquainted. All are very plucky snakes. This one coiled itself in the typical figure of 8 fashion, and erected itself and poised, thus awaiting an opportunity to strike at me, quivering the tail with anger.

* I may here mention that I received a similar specimen lately from Champaran (Behar) from Mr. H. Reid. This locality zoologically is part of that with which this paper deals. The costals were 25, 21, 21, in the three sites corresponding to the above. The ventrals and subcaudals were 158 + 59 The stomach was much knuckled and thickened, and full of nematode worms which I think were *Kalicephalus willeyi*.



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It struck out several times, but I find that if one is on the alert with these snakes, one can see and evade the stroke, so that it cannot be considered very rapid. With many snakes on the other hand one has no chance of avoiding the stroke, such for instance as *Tropidonotus piscator* and *Echis carinata*.

| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Scales. 2 heads-lengths behind head. | Scales. Midbody. | Scales. 2 heads-lengths before vent. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| 1907. | | | | | | | | | |
| Mar.25th | ♀ | 2′-4½″ | 5¼″ | 224 | 87 | 21 | 21 | 17 | |
| Apr.12th | ♀ | 2′-10½″ | 6⅞″ | 227 | 93 | 21 | 21 | 17 | Supralabials 9, the 3rd, 4th, 5th and 6th touching the eye on left side. |
| ..... | ♀ | ..... | ..... | 227 | 96 | 21 | 21 | 17 | Two præoculars. A mouse in stomach. |

It is to be noted that the scales posteriorly reduce to 17 which is remarkable, as many of the species of this genus have 21 scale rows in midbody, and in all except this they reduce to 15. I have now examined 10 specimens, and in only one did the scales reduce to 15. The absorption of rows is the same as in the other species. The scales become 19 by the absorption of the uppermost into the vertebral and very shortly afterwards the 3rd and 4th rows above the ventrals coalesce.

*Dipsadomorpus cynodon* (Boie).

A single specimen was seen to fall (or spring ?) from a palm tree about 20 feet high in Dibrugarh and was pursued and killed. It conformed to variety* B of Boulenger's Catalogue

* I may here remark that last year I obtained two well grown examples of this snake from Mr. Jacob from Jalpaiguri, which is in the same Tract zoologically as that to which this paper refers. They were of the same variety as my Assam specimen and agreed with it in the lepidosis just referred to except that the ventrals and subcaudals were 255 + 126 and 256 + 128. The absorption of the costal rows agreed except that in the step from 19 to 17, the 4th row above the ventrals was absorbed into one of the adjacent rows. Mr. Jacob wrote that one of these specimens was being attacked by a banded Krait (*Bungarus fasciatus*), and he shot the latter and then killed the former.

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(Vol. III, p. 79). It was a ♂ measuring 4 feet 9 inches, the tail being 1 foot $1\frac{3}{8}$ inches. The ventrals and subcaudals were 248+119. The scales at a point two heads-lengths behind the head were in 23 rows, at midbody 23, and two heads-lengths before the anus 15. The reductions from 23 to 21 and 17 to 15 were due to the absorption of the uppermost row into the vertebral, and that from 19 to 17 to the absorption of the 3rd row above the ventrals into the 2nd on the right side, and the 4th on the left. All three steps occurred close together.

*Dipsadomorphus quincunciatus* (Wall.)

The type was described and figured in this Journal by me last year (Vol. XVIII, p. 272), and was sent to the British Museum. Since this I acquired a second specimen from the same locality, *viz.*, near Tinsukia (Rangagara). This is now lodged in the Indian Museum.

It measured 3 feet $5\frac{1}{2}$ inches, the tail being $9\frac{3}{4}$ inches. It agrees perfectly with the first example except that the ventrals and subcaudals are 237 + 118, and the supralabials are 8, the 3rd, 4th and 5th touching the eye on both sides.

The anterior palatine teeth are barely if at all enlarged.

*Psammodynastes pulverulentus* (Boie).

In all five specimens were acquired, three from Dibrugarh, one from North Lakhimpur (Dejoo) and one from Jaipur. One of these was the gravid ♀ reported in this Journal (Vol. XVIII, p. 204), which showed that the species is viviparous. I had live examples. The one I kept some time in captivity was a truculent creature. It struck at Captain Wright to whom I was indebted for the specimen, and subsequently struck at me on more than one occasion, wounding me once in the finger when handling it. Prior to striking, it erected itself and threw the forebody into a figure of 8, much in the same way as the *Dipsadomorphus* do; another which my wife encountered at dusk erected itself, and would doubtless have struck if given the chance. I could not get my caged specimen to eat, though I supplied it liberally with small frogs every day. A frog too had been swallowed by one specimen that was brought to me dead. In the flanks there are blotches of bright ochre, and velvety blac

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which come prominently into view when the snake dilates itself. The dentition in my skulls is as follows:—*Maxillary* 2 or 3 small teeth followed by 2 large and fang-like; succeeded by 5 or 6 small and subequal, and then 2 large, grooved, obliquely placed, fang-like teeth. *Palato-pterygoid*, 8 to 10 + 22 to 25; small, subequal. *Mandibular* 2 or 3 small followed by two large and fang-like; then 13 to 16 small teeth.

*Dryophis prasinus* (Boie).

Of six specimens, one was captured in Dibrugarh, one in Sadiya, one near Jaipur (Namsang), and three in North Lakhimpur (Dejoo and at foot of Duffla Hills). The Dibrugarh, Sadiya and Dejoo specimens were green, *i.e.*, *forma typica*, the rest buff, or drab colour. This latter is a distinct colour variety, which appears to have escaped being christened. I propose for it the name *flavescens*.

| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Scales. | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2 heads-lengths behind head | Mid-body. | 2 heads-lengths before anus | |
| 1908 End of March or early April. | ♀ | 5′-7″ | 1′-7⅞″ | 205 | 167 | 15 | 15 | 13 | Buff variety, N. Lakhimpur. Contained 3 eggs, 1⅝″ × ⅞′. 4th right supralabial divided. |
| ? | ♀ | ... | ... | 205 | 155 | 15 | 15 | 13 | Buff variety. N. Lakhimpur. |
| April | ♂ | 3′-9¾″ | 1′-5″ | 203 | 173 | 15 | 15 | 11 | Buff variety. Jaipur. |
| May 31st | ♂ | 3′-6¼″ | 1′-5¼″ | 200 | 174 | 15 | 15 | 11 | Green variety. Dibrugarh. A gecko in stomach |
| ? | ♂ | ... | ... | 201 | 171 | 15 | 15 | 11 | Green variety. Sadiya. The 3rd subcaudal entire. |
| ? | ♂ | ... | ... | 209 | 159 | 15 | 15 | 11 | Green variety. Dejoo. One loreal only on left side; loreals 2 (1+1) on right side, both confluent with subjacent labials. |

In the eggs noted above, though so large, there was no trace of embryos. It will be noticed that in the ♂ the costals reduce posteriorly to 11, but in the ♀ only to 13. This is no coincidence, for

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I find referring to many specimens I have examined from Darjeeling and Burma that this appears constant.

The dentition in my two skulls does not appear to agree quite with Boulenger's figure of *D. mycterizans* (Catalogue Vol. III. p. 177).

*Maxilla.*— 6 or 7 progressively lengthening teeth from before backwards, then a short interspace followed by 3 or 4 minute teeth, then a second gap followed by two large, subequal, grooved fang-like teeth. (In Boulenger's figure two *suddenly* enlarged fang-like teeth succeed six small subequal ones in the front of the jaw.) *Palato-pterygoid* 10 + 20 or 21, small, subequal, slightly reducing posteriorly. *Mandibular* 5 or 6 rapidly increasing posteriorly; then a short gap followed by, from 12 to 14, small subequal teeth.

## Sub-family—Elapinae.

### *Bungarus fasciatus* (Schneider).

I acquired 22 examples. Two were from near Doom Dooma, one from near Tinsukia, one from North Lakhimpur at foot of Duffla Hills, and the rest from just around Dibrugarh. Of 11 sexed 5 were ♂, 6 ♀.

| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Remarks. |
|---|---|---|---|---|---|---|
| 1907. | | | | | | |
| Apr. 11th | | 2′- 0⅛″ | 2¼″ | 231 | 33 | |
| June 12th | ♂♀ | 2′- 0¼″ | .. | 221 | 36 | |
| „ 18th | | 4′- 1½″ | ... | 229 | 24 | A snake (*Tropidonotus stolatus*) 1′-9½″ long, lying at full length in gullet and stomach. |
| „ 21st | ♂ | 4′- 5″ | ... | 230 | 38 | Stomach full of scales and ventrals of a snake otherwise completely digested. Killed in the act of swallowing a snake (*Zamenis korros*) 4 feet 2½ inches long. |
| „ 23rd | ♂ | 3′-11⅛″ | 4⅛″ | 229 | 35 | |
| July 2nd | ♂ | 4′- 0½″ | 5⅛″ | 224 | 38 | Ventral and costal scales of a snake recovered from the fœcal contents of cloaca. |
| „ 13th | ♀ | 3′- 0¼″ | ... | 231 | ... | Tail incomplete. Reported in water, and in the act of swallowing a fish. Ventral and costal scales of a snake recovered from fœcal contents of cloaca. |

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| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Remarks. |
|---|---|---|---|---|---|---|
| 1907. | | | | | | |
| Oct. 18th | ♀ | 3′- 8½″ | 3⅛″ | 229 | 33 | Found in disused well. 2 temporals on left side. |
| Nov.23rd | ... | ... | ... | ... | ... | Killed at night outside bungalow ; a skink (*Mabuia multifasciata*) in stomach. |
| „ 28th | ♀ | 3′- 9¼″ | ... | 230 | 35 | |
| Dec. 3rd | ♀ | 4′- 0″ | ... | ... | ... | |
| 1908 | | | | | | |
| Apr.13th | ♂ | 4′-11¾″ | 5⅝″ | 227 | 37 | 5 eggs in the stomach are without doubt snake's eggs and measured $\frac{15}{16}$″ long. 3 of these were quite undamaged. |
| „ 4th | ... | ... | ... | ... | ... | Killed in house at night. |
| May20th | ... | ... | ... | ... | ... | Captured alive and sent to Parel. |
| Oct. 28th | ♀ | 3′- 3¼″ | ... | ... | ... | Killed in syce's hut. |

A large specimen preserved in a bottle was sent to me in the act of swallowing a snake (*Zamenis mucosus*). The tail and about 2 inches of the body were protruding from the mouth. The tail measured 1 foot 4¾ inches, indicating that the dhaman was about 5 feet in length. Mr. C. Gore told me that the first specimen he ever saw in Assam was in the act of swallowing another snake which was grasped in the middle of the body, and was struggling for liberty. He also told me that he once knew this snake to bite a bullock which died about 20 minutes or so later. Major Leventon, I. M. S., told me that he once killed a gravid ♀ at Sibsagar, which measured 6 feet 1½ inches. Unfortunately he could not be certain of the date.

This snake like all the other Kraits with which I am acquainted is singularly lethargic, and most difficult to anger. I had many brought to me alive, and had ample means of observing its disposition. I did my utmost to provoke one to strike but could not. It simply lay where it was, and made no attempt to escape. When irritated it hid its head beneath its body. When taken by the tail, and roughly shaken, it simply flattened itself, and then buried its head again beneath the body. When a stick was thrust quickly at it, it

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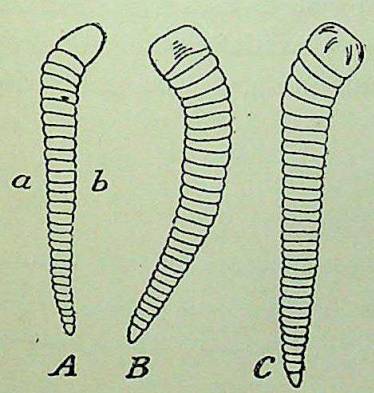
merely avoided the thrust and when advanced towards it slowly, it retracted itself leisurely. Another large one was brought to me at my hospital by several urchins, who carried it balanced over a stick with the result that every few yards it fell off, but it made no attempt at escape and allowed itself to be taken up and dropped again and again. I watched this noisy band of urchins for some minutes advancing up the road. I then took it by the tail and carried it 300 yards or so home, and worried it in every way to try to get it to strike, but it merely hid its head beneath its coils and lay before me unconcerned. Other specimens behaved similarly.

Its movements are very slow, at any time, and it frequently happens that the planters, who own motor cars, drive over them on the roads at night. The specimen which was disturbed whilst eating a fish is reported to have made off, and climbed a tree to the height of some 10 feet or so. It was knocked off by a lathi and killed.

The secretion of the anal glands is blackish, reminding one of mercurial cream in appearance and consistency. The eye is black as in other kraits, the pupil not being visible.

This like many other snakes is very much infested with parasites. I found two different nematode worms in the stomach, which Dr. Annandale had identified for me as *Kalicephalus willeyi*, and larvæ and immature forms of a species of *Ascaris*. There were many tape worms too in the abdominal cavity usually convoluting themselves beneath the lining membrane. These are larval forms of a species of *Pterocercus*. The maggot-like parasite *Porocephalus brotali* was also frequently found in the abdominal cavity (see figure attached).




Porocephalus brotali, (×8.)
A. Profile (*a*) dorsal (*b*) ventral borders.
B. Dorsal aspect.
C. Ventral aspect showing hooklets.

*Dentition.*—I cannot agree with Boulenger's description of the fangs (Catalogue Vol. III, page 365), which he says are grooved in this genus. He seems to suggest that the fang is not tubular, but as far as I am aware the fangs of all poisonous Indian, I may say, Asian, snakes are tubular. On the anterior face of the fangs there is a shallow

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groove, which is the seam marking the spot where the circumflexed walls of the canal have become blended.

The *maxilla* has two moderate tubular fangs placed anteriorly side by side (unless one has been shed). These are grooved on their anterior faces. Behind these are (3 or 4) small subequal teeth, which are grooved on their outer faces. *Palato-pterygoid* 12+11 or 12, small, subequal, grooved on their inner faces. *Mandibular* 16 or 17, small, subequal, and grooved on their outer faces. It will be noticed in each case that the grooves are on the face opposite to the side occupied by the sac or tract, as the case may be, from which the fang or teeth are produced.

*Bungarus lividus* (Cantor).

I had one specimen sent to me from Bindukuri near Tezpur by Mr. A. E. Lloyd. This is much the largest specimen I have ever seen measuring 3 feet 2 inches, the tail $3\frac{3}{4}$ inches. The ventrals and subcaudals were 215+37. The vertebrals were but slightly enlarged, the length at midbody distinctly exceeding the breadth. Mr. Lloyd told me he had had the specimen some 12 years, hoping some day to meet some one who could tell him what it was. It had bitten a cooly woman on his Estate at about 10 o'clock one night whilst she sat under the eaves of the verandah of her hut eating her evening meal. She was conscious the next morning, and spoke in answer to the questions put to her concerning her accident. She died some time during that day, the hour he does not remember. Unfortunately no records of her case were available after this long lapse of time.* (Compare the Vertebrals in fig. 8 of our plate with those of *B. niger* in figure 7).

*Bungarus niger* (spec. nov.)

(Figs. 4 to 7 of Plate.)

I have already referred to this Krait as a definite and valid species apart from *lividus*,† but as yet have not published a description in detail. I collected 9 specimens, 7 in Dibrugarh, 1 from Sadiya, and one from Jaipur.

* I may here record the receipt of a specimen of this Krait from Jalpaiguri from Mr. Jacob, I.F.S., since this locality is zoologically part of the Brahmaputra Valley. This specimen was a young one measuring 1 foot $1\frac{1}{4}$ inches. The ventrals and subcaudals were 212 + 39 The vertebrals were but feebly enlarged.

† Poisonous Terrestrial Snakes of our British Indian Dominions, 1908, pp. vii and 19.

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| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals | Remarks. |
|---|---|---|---|---|---|---|
| 1907. | | | | | | |
| ... | ... | 2′-9″ | ... | 225 | 53 | Old spirit specimen. |
| April 23rd. | ♂ | 3′-4¾″ | 5⅞″ | 229 | 54 | |
| May 17th. | ♀ | 2′-5″ | 4¼″ | 224 | 52 | Found in a well. |
| June 18th. | ♂? | 4-0½″ | 6⅞″ | 216 | 51 | |
| ? | ? | ... | ... | ... | ... | Head and forebody from Sadiya. |
| Oct. 17th. | ♂ | 3′-3¼″ | 5½″ | 223 | 53 | Killed in a grain godown in the bazaar at night. |
| 1908. | | | | | | |
| June 1st... | ♂ | 3′-10¾″ | 6¾″ | 221 | 55 | |
| ,, 17th. | ♂ | 3′-8″ | 6″ | 222 | 51 | Killed at night, passing through chowkidar's feet. |

The snake is very much like *lividus* with which it was confused by Sclater*. I have examined two of the three examples he referred to which prove to be examples of *niger*; the third probably a true *lividus* is no longer in the Indian Museum. I have now examined 18 specimens of *niger*, and 13 of *lividus* and find that in the former the vertebrals are broader than long in the middle of the body, and the ventrals and subcaudals are more numerous. In the latter the vertebrals are but slightly enlarged on the body. Our artist has shown them distinctly broader than is actually the case in figure 8 of our Plate. In all my specimens the length of these shields exceeds the breadth at midbody. As in other Kraits the eye in life is quite black so that the pupil cannot be seen. The tongue tips too are white. The secretions of the anal glands is black.

*Description—Rostral.*—Touches 6 shields; the rostro-internasal and rostro-nasal sutures are subequal, and fully twice the length of the rostro-labials. *Internasals.*—Two; the suture between them is about half that between the præfrontal fellows. *Præfrontals.*—Two; the suture between them is rather greater than the internaso-præfrontals; in contact with internasals, post-nasals, præoculars, supraoculars, and frontal. *Frontal.*—Touches 6 shields, the fronto-parietals rather the longest. *Supraoculars.*—Length about $\frac{3}{5}$ to $\frac{2}{3}$, the frontal, breadth less than $\frac{1}{2}$ the frontal along a line connecting the centres of the eyes. *Nasals.*—Divided; in contact with 1st and 2nd supralabials. *Præocular.*—One, barely reaching crown. *Postoculars.*—Two. *Temporals.*—One; in contact with the 5th and 6th supralabials.

* Journal, As. Soc., Bengal, Vol. LX, p. 246.



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*Supralabials.*—7 ; the 2nd narrowest, distinctly more so than the 1st and 3rd ; the 3rd and 4th touching the eye. *Infralabials.*—4 ; the 4th largest, and in contact with two scales behind ; the 3rd and 4th touching the posterior sublinguals. *Sublinguals.*—Two pairs, the anterior rather larger. *Costals.*—Two heads-lengths from head 15, midbody 15, two heads-lengths before anus 15. Vertebrals well developed, broader than long in midbody. Keels absent. Apical pits absent. *Ventrals.*—216 to 231. *Anal.*—Entire. *Subcaudals.*—47 to 57, all entire. *Colour.*—Uniform black above, belly whitish, more or less sullied, or mottled with slatish behind, especially beneath tail. Sides of throat, chin, and lips some times tinged yellow. *Dentition.*—*Maxillary.*—Two large tubular fangs side by side in front, succeeded after a gap by 2 or 3 small subequal teeth grooved on their anterio-external aspect. *Palato-pterygoid* 11+11, small, subequal ; the posterior pterygoid gradually reducing in length ; grooved on their inner faces. *Mandibular* 17, the 3rd, 4th and 5th rather longest, grooved on their outer faces.

*Naia tripudians* (Merrem).

Of 15 specimens collected, three were from Sadiya, two from near Tinsukia (Rangagara), one from North Lakhimpur (Dejoo), two from near Doom Dooma (Hansara), two from near Jaipur, and the rest from Dibrugarh. All of the specimens belonged to variety *fasciata*, some being olive-brown and others blackish. Mr. C. Gore tells me however that last year he killed a specimen in his tea-house at Barahapjan with perfect spectacles on the hood (var. *typica*). Two specimens from Dibrugarh, and one from Jaipur had the scales in 19 rows at midbody. In all the rest there were 21, but whether the costals were 19 or 21 at midbody, they reduced to 15 at a point two heads-lengths before the anus, except in one instance when they came to 13, the rows in midbody being 19. One example had eaten a toad (*Bufo melanostictus*). *Dentition.*—In two skulls before me this is as follows:—*Maxillary.*—A pair of tubular fangs placed side by side anteriorly, followed after a gap by one small tooth grooved on its outer side. *Palato-pterygoid* 7 to 8+11 to 15, small, subequal, grooved on their inner side. *Mandibular* 14, the 3rd and 4th rather longest, grooved on their outer faces.

The cobra appears to be far less common in Assam than it is in most parts of India.

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*Naia bungarus* (Schlegel).

I only secured one specimen, though the hamadryad would appear to be by no means uncommon in Assam. The one brought to me was a ♂ 11 feet 5 inches in length, the tail 2 feet 1½ inches. This was killed within 3 miles of Dibrugarh. The ventrals were 243, and the subcaudals 93; the 1st, 3rd, 4th and 5th only of the latter being entire. The scales at a point two heads-lengths behind the head were 17, in midbody 15, and two heads-lengths before the anus 15. The reduction from 17 to 15 was brought about by the coalescence of the 4th and 5th rows above the ventrals. The vertebral row was slightly enlarged. It was olive-brown, rather darker in shade posteriorly, and had very obscure light narrow bands which became much more apparent on separating the scales. The fang was ⅜ inch long.

Though unfortunate in acquiring specimens, I was able to collect a good deal of information about this snake from various planters and others.

Mr. Gardiner of Tezpur, who has captured specimens for the Calcutta Zoological Gardens, was also successful in securing the living specimen sent last year to our Society's collection. He tells me the Assamese call this and the cobra "fatty sap."

Mr. J. H. Bandock told me that one was killed some years ago at Margherita, which measured 14 feet 6 inches. Mr. N. C. Manders' coolies killed another specimen of the same length at Talup on the 17th October last year. I wrote to him about it, and he sent me a sketch of the shields on the head which placed the identification beyond question. This was found asleep in a drain in the day-time by his coolies, and when disturbed, menaced them with expanded hood. It was, he says, black with a pale throat. His coolies, who are Indians, probably Santals, called it "nag," and "nauk samp." He says this creature called to mind another which was killed in or near the same drain about 7 years before, measuring about 10 feet. This was a truculent beast that used to stop the coolies going along the road.

As regards food, Mr. Moore told me that he well remembers one being killed in North Cachar which, when cut open, contained a large monitor lizard. Here I may remark that another specimen killed at Buxa Dooars last year, measuring 9 feet 11½ inches, was found to have swallowed a large monitor lizard 3 feet 9 inches long. Captain

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Mackenzie, my informant, says one of the sepoys of his detachment was out after a khakur (*Cervulus muntjac*). When he fired the hamadryad went for him, and he fortunately shot it too.

I have for many years been trying to elicit information on the breeding of this snake. Mr. A. J. Harrison told me that at Meckla Nuddee (across the river above Dibrugarh) he has encountered 3 hamadryads in five years. One he saw in a hollow tree, on the ground sitting on eggs. As he could not remember precisely the date, he sent for two Miris who were with him at the time. They said it was in the middle of May and that the eggs were about 30 in number. Mr. Harrison shot the snake. These men said further that on their way down to the Mills that day (15th May), they had passed a similar snake coiled upon her eggs, with her head up and hood dilated as they passed. They said you may always be sure they have eggs when they sit like that ready to strike.

Mr. W. A. Jacob, I. F. S., from whom I received a small hamadryad from Jalpaiguri last year, told me that a pair of hamadryad were reported as having been "seen in copula" and killed in a tea-garden close to him at Jalpaiguri at the end of April or early May 1908. Mr. Lister too, of Pashok near Darjeeling, told me that the natives around him say that the hamadryad has young in April, and it appears a female was killed there with 23 eggs in the abdomen.

*Dentition.*—This in my large specimen is as follows :—*Maxillary.*—Two large tubular fangs side by side anteriorly, followed after a gap by 3 small teeth grooved on the outer sides. *Palato-pterygoid* 8 to 9 + 10 to 12, grooved on their inner faces. *Mandibular* 15, the 3rd and 4th longest; grooved on their outer faces. The poison gland measured $1\frac{3}{8}'' \times \frac{9}{1}'' \times \frac{8}{16}''$ high.

*Callophis macclellandi* (Reindardt) (var. nov. *gorei*).

I received three specimens of a new variety of this snake from Mr. Gore from Jaipur.* This I propose to call *gorei*. The general colour of the snake is similar to that of the other varieties, *viz.*, a bright berry-red.

It is peculiar in having no black rings round the body, and no black vertebral line. This latter is replaced by a series of small distant black spots. The type I sent to the British Museum and the second specimen to our Society's collection. The type was a ♀ 1 foot 10 inches long,

* See remarks on locality under *Trachischium monticola*.

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the tail being 1½ inches. The ventrals and subcaudals were 241 + 46. The second was a ♂. The ventrals and subcaudals were 219 + 30. The third very young, with 223 ventrals, and 31 subcaudals.

The type was sent to me alive. It exhibited a distaste to being handled but could not be provoked to bite an object; when taken by the neck a good large drop of poison collected below the rostral through which the tongue was protruded. It flattened itself posteriorly under excitement.

AMBLYCEPHALIDÆ.

*Amblycephalus monticola* (Cantor).

Two specimens were collected. One captured in Dibrugarh, and the other at Jaipur. It is essentially a hill snake, so that it is remarkable to find it in the plains as far distant from the hills as Dibrugarh. The ventrals and subcaudals were 188 + 85, and 190 + ?. There is nothing special to remark upon, except that the secretion of the anal glands is custard-like in colour and consistency.

VIPERIDÆ.

*Lachesis gramineus* (Shaw).

The green pit-viper is not very common in the plains of Assam I got 7 specimens in all. One was from Jaipur, one from North Lakhimpur (Joyhing), and the rest from around Dibrugarh. One specimen was greenish-yellow with a mustard-yellow flank line. In the Joyhing specimen the flank line was chocolate and white as noted in specimens from the Khasi Hills.

| Date. | Sex. | Length. | Tail. | Ventrals. | Subcaudals. | Remarks. |
|---|---|---|---|---|---|---|
| 1907. | | | | | | |
| April 3rd... | ♀ | 1′-11½″ | 3⅝″ | 164 | 60 | Contained 2 eggs (1 in each ovary), ¾″ long. |
| Sept. ... | ♀ | 2′- 5½″ | 5″ | ... | ... | A rat in stomach, and large mass of matted hair in cloaca. |
| Nov. 9th... | ... | .. | ... | 169 | 56 | A mouse in the stomach. |
| May 7th... | ♂ | 1′-10⅛″ | ... | 169 | 66 | |
| ? | ♀ | ... | ... | 175 | 55 | |

One encountered in November was found lying on a low bush in jungle. It refused to bestir itself, though probed and hustled with a stick. It finally wreathed itself round the stick, and was removed from the bush, but offered no malice.

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| | NAME OF SNAKE. | 1907. | | | | | | | | | | 1908. | | | | | | | | | | | | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June 1st to 18th. | July | August. | September 19th to 30th | October. | November 1st to 22nd | Date uncertain. | |
| 1 | Typhlops braminus | .. | 2 | 7 | .. | 1 | On leave in Khasi Hills. | .. | .. | .. | .. | .. | .. | .. | 1 | 3 | 1 | .. | On leave in Darjeeling. | .. | .. | .. | .. | 15 |
| 2 | " diardi | .. | 2 | .. | 2 | 5 | | .. | .. | .. | .. | .. | .. | 3 | .. | 1 | .. | .. | | .. | .. | 1 | 6 | 20 |
| 3 | Python molurus | .. | .. | 1 | .. | .. | | .. | .. | .. | .. | .. | 1 | .. | .. | . | .. | .. | | .. | .. | .. | 2 | 4 |
| 4 | Tropidonotus piscator | 1 | 12 | 14 | 16 | 10 | | .. | 9 | 8 | 10 | 6 | 8 | 2 | 5 | 5 | 1 | .. | | .. | 1 | 2 | 2 | 112 |
| 5 | " himalayanus | 1 | 1 | 3 | 1 | 1 | | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 1 | .. | | . | 1 | .. | 3 | 15 |
| 6 | " stolatus | 1 | 36 | 26 | 12 | 7 | | .. | 8 | 1 | .. | .. | 2 | 18 | 15 | .. | .. | .. | | .. | 1 | 2 | 20 | 159 |
| 7 | " subminiatus | .. | .. | .. | .. | .. | | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 2 | .. | | .. | .. | .. | 1 | 4 |
| 8 | Trachischium monticola | .. | .. | .. | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | | .. | .. | .. | 1 | 1 |
| 9 | Lycodon jara | .. | .. | 1 | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | | .. | .. | .. | 2 | 3 |
| 10 | " aulicus | 1 | 5 | 7 | 4 | 9 | | .. | 2 | 1 | 1 | .. | .. | 1 | 5 | 4 | 1 | .. | | 1 | 1 | .. | 4 | 47 |
| 11 | Dinodon septentrionalis | .. | .. | .. | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | | .. | .. | .. | 1 | 1 |
| 12 | Zamenis korros | .. | .. | 2 | 3 | 2 | | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | .. | | .. | .. | .. | 2 | 13 |
| 13 | " mucosus | 1 | 7 | 10 | 11 | 9 | | .. | 2 | 1 | .. | .. | .. | 4 | 2 | 3 | 5 | .. | | 1 | .. | 2 | .. | 58 |
| 14 | Coluber prasinus | .. | .. | .. | .. | .. | | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | | .. | .. | .. | 1 | 1 |
| 15 | " radiatus | .. | 2 | 4 | 9 | 3 | | .. | 3 | .. | .. | .. | 2 | 2 | 1 | 1 | .. | .. | | .. | 1 | .. | 13 | 41 |
| 16 | " porphyraceus | .. | .. | .. | .. | .. | | .. | . | .. | .. | .. | .. | .. | .. | .. | .. | .. | | .. | .. | .. | 2 | 2 |
| 17 | Dendrophis pictus | .. | .. | .. | .. | .. | | .. | . | .. | .. | .. | .. | .. | .. | .. | .. | .. | | .. | .. | 1 | .. | 1 |
| 18 | " proarchos | .. | .. | 7 | 4 | .. | | .. | 2 | .. | .. | .. | 1 | 2 | 1 | 2 | .. | .. | | .. | .. | .. | 5 | 24 |
| 19 | " gorei | .. | .. | .. | .. | .. | | .. | .. | .. | .. | . | .. | .. | .. | .. | .. | .. | | 1 | .. | .. | 1 | 2 |

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| | NAME OF SNAKE. | 1907. | | | | | | | | | | | | 1908. | | | | | | | | | | | | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | January. | February. | March. | April. | May. | June 1st to 18th | July. | August. | September 19th to 30th | October. | November 1st to 22nd. | Date uncertain. | |
| | | | | | | | On leave in Khasi Hills. | | | | | On leave in Darjeeling. | | | | | | | | | | | | |
| 20 | Dendrophis biloreatus .. .. .. .. | : | : | : | : | : | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | 1 | 1 |
| 21 | Simotes albocinctus .. .. .. .. | : | : | : | : | : | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | 8 | 9 |
| 22 | ,, violaceus .. .. .. .. | : | : | : | : | 1 | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | 2 | 2 |
| 23 | Oligodon dorsalis .. .. .. .. | : | : | : | : | : | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | 1 | 1 |
| 24 | Hypsirhina enhydris .. .. .. .. | : | : | : | : | : | | : | : | 1 | : | : | : | : | : | : | : | : | | : | : | : | : | 1 |
| 25 | Dipsadomorphus gokool .. .. .. .. | : | 1 | 1 | : | : | | : | : | : | : | : | : | : | 1 | : | : | : | | : | : | : | 1 | 4 |
| 26 | ,, cynodon .. .. .. .. | : | : | : | : | : | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | : | 1 |
| 27 | ,, quinquelatus .. .. .. .. | : | : | : | : | : | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | 2 | 2 |
| 28 | Psammodynastes pulverulentus .. .. .. .. | : | : | 1 | : | 2 | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | 2 | 5 |
| 29 | Dryophis prasinus .. .. .. .. | : | : | : | : | : | | : | 1 | 2 | 1 | : | : | : | 2 | : | : | 1 | | : | 1 | : | 6 | 6 |
| 30 | Bungarus fasciatus .. .. .. .. | : | 1 | : | 4 | 2 | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | 1 | 22 |
| 31 | ,, lividus .. .. .. .. | : | : | : | 1 | : | | : | 1 | : | : | : | : | : | : | : | 2 | : | | : | : | : | 3 | 1 |
| 32 | ,, niger .. .. .. .. | : | 1 | 1 | 2 | : | | : | : | : | : | : | : | : | : | : | : | : | | 1 | : | : | 10 | 9 |
| 33 | Naja tripudians .. .. .. .. | : | : | 2 | : | : | | : | : | : | : | : | : | : | : | : | : | : | | : | : | : | : | 15 |
| 34 | ,, bungarus .. .. .. .. | : | : | : | : | : | | : | : | : | : | : | : | 1 | : | : | : | : | | : | : | : | 3 | 1 |
| 35 | Callophis macclellandi .. .. .. .. | : | : | : | : | : | | : | : | : | : | : | 1 | : | : | : | : | : | | : | : | : | 1 | 3 |
| 36 | Amblycephalus monticola .. .. .. .. | : | : | : | : | : | | : | : | 1 | : | : | : | : | : | 1 | : | : | | : | : | : | 3 | 2 |
| 37 | Lachesis gramineus .. .. .. .. | : | 1 | : | : | : | | 1 | : | : | : | : | : | : | : | : | : | : | | : | : | : | : | 7 |
| | Total .. | 6 | 71 | 97 | 69 | 52 | | 1 | 29 | 15 | 12 | 6 | 15 | 33 | 33 | 23 | 17 | 1 | | 4 | 6 | 8 | 117 | 615 |

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# THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

## (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

*Part VII.*

(*Continued from page 682 of this Volume.*)

**45. Moduza procris**, *Cramer* (fig. 9).—Male and female *upperside* rich ferruginous red. Fore and hindwings with a series of short black transverse lines at base, three on the fore, four on the hindwing; on the hindwing these lines occur in cellular area only and are very slender with a black spot in each of the interspaces above them; a white spot, varying in size, at apex of cell on forewings; a broad white, macular, slightly curved, common discal band, set in a dusky background, interrupted anteriorly on forewing; the spots in interspaces 4, 5 and 6 are detached and slightly out of line, the first very small. Forewing: terminal margin somewhat broadly dusky black, the black produced in conical shape inwardly in the interspaces and traversed by two slender, lunular, pale lines. Hindwing: a postdiscal series of transverse black spots followed by an outer row of smaller spots, a subterminal lunular black line and a narrow terminal black band; a pale, somewhat sinuous line interposed between the subterminal and terminal markings. *Underside* with similar but more clearly defined markings; base of fore and basal two-thirds of the hindwing pale blue; on the hindwing the white discal band with its dusky black margins superposed on the blue area; the postdiscal series of black spots on the hindwing diffuse; the sinuous lines traversing the black terminal margin on both fore and hindwing broader, more prominent and the interspaces along the extreme margin touched with white. Antennæ black, ochraceous at apex; head, thorax and abdomen dark ferruginous red; beneath bluish white. Exp. 62-78 mm.

*Larva.*—The body is cylindrical, with spined processes, laterally flattened and somewhat fleshy, on segments 3 to 12. Head large, flat, surrounded with 2 rows of pointed spines, one inside the other, the spines of one row alternating with those of the other; inside the spines, on the face, is a semicircle of 6 brownish-red rounded tubercles, inside these again are 4 more similar tubercles. Segment 2 has a central row of 8 minute spines. Each segment 3-12 has a subdorsal and a lateral pedicelled, laterally flattened bunch of spines; the subdorsal bunch of segment 4 being the longest, directed up and somewhat outwards; the subdorsal bunches of segments 3, 6, 11 and 12 are somewhat shorter and directed upwards; those of segments 7 and 8 are smaller again (of equal size to each other) and are directed nearly horizontally outwards; the subdorsal bunches of segments 5 and 6 are very small; the lateral bunch of segment 3 is

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equal in length to the subdorsal of segment 3 ; the rest of the lateral ones are all a good deal shorter and subequal ; segments 13 and 14 have each a subdorsal bunch of small spines ; besides the foregoing bunches there is also a spiracular line of small spines from segment 3 to 12 as well as a subspiracular pair of minute spines on the same segments. Spiracles small, oval, black. Surface of body somewhat roughened. Color of larva is a dirty grey, often inclined to chestnut-brown, always with blackish blotches ; there is a thin white dorsal line on segments 2-4 ; the subspiracular bunch of spines of segment 6 are whitish yellow and rise from a white patch ; all pedicels and spines are yellow-brown ; segments 11 and 12 are light yellow laterally ; abdomen lighter in colour than dorsum. L : 32 mm. ; B : 4mm.

*Pupa.*—The pupa is angular with flattened expansions on head and on dorsal line of abdomen. It is of the *Athyma* (*vide* Pl. 1, fig. 10 a) type, but is more curved in the longitudinal axis ; the head processes are bent forward and the ventral line of wings is convex as well as that of abdomen. The head and segment 2 together are nearly square seen from above, slightly broader in front, with two processes proceeding out in front, one from each eye ; these processes are thick at origin, dilated each into a triangle, flattened above and below, the two touching at the inner basal angles (their apices being nearest the head) so as to leave a circular space between the touching angles and front of head, the bases of the two triangles (their free front edges) being in the same slightly curved line at right angles to longitudinal axis of pupa ; these processes are longer than segments 1 and 2 together. Segment 2 is flat dorsally. Thorax is slightly keeled in the dorsal line and is evenly convex ; its surface somewhat bumpy ; the shoulder ridges running out, each, into a lateral short, sharp point ; wings expanded somewhat from just behind shoulders, the lateral edge being sharp, curved up towards dorsum of segment 5, then evenly down to end at segment 8. The pupa is broadest at segment 7-8. The surface of each wing is somewhat concave in centre towards lateral edge of pupa. The dorsal constriction behind thorax is prominent owing to segment 6 being suddenly higher than segment 5: it overhangs segment 5 somewhat in fact, this sudden height being produced by a somewhat large lateral tubercle and a low, rough, dorsal carina or keel beginning at segment 6 and ending at segment 12, its length separated into parts by the segment-divisions, these portions on segments 10, 11, 12 being high, laterally much compressed and rectangular in outline but low on segments 8 and 9 ; the lateral tubercles, existing only on segments 6, 7, 8 are flat dorsally and perpendicular to the segment surface as to their lateral faces. Segments 12 and 13 are dorsally flattened and slope towards the cremaster ; the cremaster is very broadly triangular, hollowed out dorsally owing to the prominent extensor ridges ; the ventral extensor ridges also prominent. Spiracular expansions of segment 2 are small, round, somewhat spongy looking, golden in colour ; the other spiracles are rather large, oval, brown. Surface of pupa slightly transversly creased-rugose with a few isolated, very short, bright golden hairs ; a lateral coarse, low tubercle



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on segments 3, 4, 5. Colour of pupa is dull chestnut marked with whitish and greyish in places rather obscurely ; surface of wings very dark ; border of wings and antennæ black ; some black lines on wings ; a ventral white chain-mark down centre of abdomen. L : 24mm.; B : 11mm. at segment 7 ; at shoulders : 7·5mm.; across base of head-processes : 7mm.; L. of head-processes : 2·5mm.

*Habits.*—The egg is laid at the point of a leaf; the young larva, emerging, proceeds to eat the point, leaving the midrib untouched, in a straight line at right angles to that midrib, throwing up a rampart of its droppings and web along the eaten edge, thus separating the free midrib from the leaf-surface. On this rib the larva sits, generally slightly curled, and resembles the rampart so perfectly in colouration and, to a certain extent, in general aspect, that it is easily overlooked. The very young larva prolongs the midrib by adding particles of excrement to the point of it. It sticks to this method of protection until the last stage, changing the leaf of course occasionally if necessary. It generally goes to other leaves for food after the first two stages but occasionally dines off the edges of its own particular one. In the last stage it wanders about, being no longer so inconspicuously coloured and may be found in the middle of a leaf anywhere on the plant or tree when at rest. Even in this last stage, however, it looks very like a bird-dropping at times when sitting with its head bent back on its side, which is a favourite resting position. The larva may even rest on the underside of a leaf in this last stage. It wanders a little prior to pupation and finally fixes itself on to the under surface of some leaf where it spins a copious wad of silk to hang by. The pupa is fixed very rigidly to this wad and hangs quite perpendicularly though with the body generally somewhat curved and resembles much a freshly withered, red-brown, rolled leaf or leaf-portion. The pupa is occasionally attached to a perpendicular stem or branch. There are generally two or three, sometimes even as many as a dozen larvæ on a single tree. The butterfly is a strong flyer with the habits of the *Athyma* group (*Pantoporia*, *Athyma*, *Limenitis*), that is it holds its wings horizontal, sailing along for short intervals ; is fond of the sunlight and therefore frequents dry hill sides in the jungly parts of the country where the monsoon is heavy. The males are as commonly seen as the females. Its distribution is Peninsular India in regions of heavy rainfall ; Assam ; Burma and Tenasserim, extending into the Malayan

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Subregion. It will be found in Thana and in all hill stations of the Bombay Presidency. The foodplant of the larva is *Mussœnda frondosa* the well known scandent shrub with the small red tubular flowers and showy white calyx-segments resembling leaves in size and development; *Wendlandia exserta*, Dc., with opposite leaves, and *Wendlandia Notoniana*, Wall., with three-whorled leaves, both plants generally shrubby in nature, sometimes growing to small trees and found in somewhat dry situations; *Sarcocephalus missionis*, Haviland, a small tree with shiny long leaves and globular heads of closely growing greenish small flowers which affects the banks of rivers in North Kanara. All three genera are belonging to the family of the *Rubiaceæ*. It also feeds upon *Stephegyne parvifolia*, Korth (*Mytragyna*, Korth.) a large tree belonging to the same family known by the vernacular name of *Kalam*.

**46. Athyma perius,** *L.* (Plate C, fig. 14) and (fig. 12).—Male and female *upperside* black (perhaps blackish brown in the female), with the following white markings: forewing: a clavate, white discoidal streak, twice divided, a cone-shaped large spot beyond; a much curved discal macular band, the spots composing it in interspaces 1, 1*a*, 2 broad, rectangular, in interspace 3 small, subtriangular, in interspace 4 circular or oval, in 5 and 6 elongate, shifted obliquely inwards; a postdiscal, sinuous line of transverse narrow spots and a subterminal line of obscure, short lunules. Hindwing: discal band of forewing continued subbasally across, broad and not macular, traversed only by the veins; a postdiscal macular band, inwardly margined by a series of round black dots and a subterminal line of obscure lunules as on the forewing. *Underside* golden ochraceous yellow; the white markings as on the upperside, but heavily margined and defined with black; interspace 1*a* with subbasal and interspace 1 with preapical patches fuliginous black on forewing; postdiscal band on hindwing margined inwardly with pale blue, bearing a superposed series of black spots, the pale blue extended along the veins crossing the band; both fore and hindwing with a prominent terminal narrow black band; the cilia white alternated with brown. Antennæ black; head with a spot of golden ochraceous between the eyes; thorax with a band or two of bluish spots anteriorly and posteriorly; abdomen transversely narrowly barred bluish white; beneath: the palpi, thorax and abdomen pure white; in the female the abdomen has a double lateral row of minute black dots. Exp. 60-70mm.

*Larva.*—The shape is cylindrical like that of *Moduza*; there are three rows of pedicelled spines, one subdorsal, one lateral and one subspiracular; the colour is greenish, the pedicels being red. The head is round, the face only very slightly convex, with a marginal row of 8 sharp, simple, rather long somewhat shiny dark brown spines directed out at right angles to the longitudinal axis of larva; inside this row towards front is another row of 10 hard

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conical tubercles ; both rows reach down to the jaws ; the 2 central tubercles are the longest ; inside the row of tubercles are, towards the top of face, two hemispherical, rather large tubercles in a horizontal line and underneath these again is a row of four across the face, the outside one on each side being as large as the two in the line above, the central 2 smaller ; halfway down each side of clypeus are two more tubercles, one diagonally below the other ; the colour of the head is black, the spines being also black, the tubercles yellow. Segment 2 has a subdorsal and lateral pair of very small yellow tubercles. Each segment 3-13 has a subdorsal hard pedicel of small sharp spines, those of segments 3 and 4 being equal and longer than any other : perhaps that of the 4th is a trifle longer than that of 3rd ; those of segments 6, 8, 11 are nearly as long as these last ; those of 7 and 9 a little shorter, those of 10 still shorter and those of the 5th segment shortest of all, being $\frac{1}{3}$ the length of those of segment 4 ; those of segment 3, if laid on the body, would overreach the head slightly. Each segment 4-12 has a lateral similar spined pedicel, but much shorter, being only about $\frac{2}{3}$ the length of the subdorsal one ; and those of segment 12 are simple yellow spines. Each segment 3-13 has a subspiracular row of simple spines as well as a pedicel of spines equal in length to the lateral ones, with the exception of that of segment 13 which is somewhat smaller ; the subspiracular of segment 14 is represented by a simple small yellow spine. This anal segment has four longish dorsal, simple spines arranged, in a square, springing from a raised, hard callosity. Spiracles are of ordinary size, black, with broad brown streak, flush. Body surface is smooth and dull. Colour of body is dark yellowish green, the subdorsal and lateral pedicels rising from purple circular marks, these marks meeting across the back on segment 9; there are a lot of black dots in front and behind the mark on segment 9 ; there are also a few black dots in front of bases of subspiracular pedicels ; all pedicels are blood-red, the spines of the subdorsal ones are black, those of the others are yellow. The subdorsal pedicels, except those of segment 5, have black-tipped spinules below the top bunch. The subdorsal pedicels of segments 4, 7, 9 are further apart than those of others. Base of abdomen and legs dark red-brown ; belly greenish. L : 37 mm ; B : 5 mm ; L. of longest pedicels with spines : 3 mm.

*Pupa.*—The shape is that of *Moduza procris* except that the dorsal process on segment 6 is broader and longer, the thorax-apex more produced backwards and the head-processes ear-shaped instead of triangular. Here the dorsal ridge or carina is flattened into square-topped expansions on segments 6-11 ; that on segment 6 is the largest by a long way and the pupa is, therefore, highest at that point : it is sharp-edged and axe-shaped, the projection directed forwards, the expansions of segments 7 and 8 really forming, in a way, part of it, being quite small ; and situated on its hinder edge or slope ; those on segments 9, 10, 11 are quite separated from each other, somewhat toothlike, the first smallest, the last largest. The thorax has the apex produced into a sharp-edged, rounded peak, slightly overhanging segment 4, this peak being nearly as high

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as the expansion on segment 6, the top of which it approaches, that is, the tops of the two are nearer each other than the bases; the thorax is carinated and the dorsal slope of pupa from its apex forward is gradual, falling suddenly at head-vertex ; segment 2 flattened on dorsum ; head produced over each eye into a sharp triangular ear-like process which curves outwards ; at each shoulder, on the dorsoventral margin of pupa, is a two-toothed short process situated in the plane joining the spiracular lines of pupa, separated from the point where wing-expansion commences by a rounded sinus ; that point also slightly produced and flattened. The spiracles are ordinary. Surface smooth, shiny ; a semicircle of four small conical tubercles anteriorly ; a small tubercle on segment 5 ; segments 6, 7, 8 somewhat carinated in dorsal line and with a small lateral tubercle ; segments 9-12 with a minute subdorsal tubercle. Colour red-brown, suffused with gold on the wing-cases and dorsum, L: 25mm ; B : 10mm.

*Habits.*—The habits of the larva in all stages are the same as for *Moduza procris*. The larva turns yellow, with greenish blue blotches, before pupating. The pupa is formed on the underside of a leaf, very generally low down near the ground. The butterflies generally fly near the ground in the underwood and these, when caught, are mostly females. They are probably bent on laying eggs. They have the same flight as *Moduza*, but are more deliberate in their movements ; and they are not quite so fond of the sun. Like *Moduza*, the insect rests with outspread wings, generally at the tip of a leaf. Neither of the two species light on the ground, though they may do so occasionally on a hot day to get moisture. It is not very common anywhere to catch or see, but the larvæ can be found in large numbers in some localities. These, however, are very liable to be parasitised by ichneumons when small. The butterfly, when resting at night, closes the wings over the back as do all of its type. The distribution is "throughout the Himalayas ; the hills of Central, Eastern and Western India, but not, as far as is known, in Ceylon ; Burma ; Tenasserim, extending to Siam and the Malay Peninsula." The food plants are belonging to the botanical family *Euphorbiaceæ* which includes many plants with milky juice. This insect confines itself to the single genus *Glochidion* and has been bred on *G. velutinum*, Wight and *G. lanceolarium*, Dalz., both undershrubs or small trees, the former with velvety long oval leaves, growing in the drier localities at lower levels, the latter affecting the damper, higher parts of the country, with longer, shiny, rather hard leaves, both with inconspicuous greenish flowers in the axils of the leaves and round

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flattened fruits dividing up into 3 or 4 parts from the centre. Both these species are distributed throughout India in the hills.

**47. Rahinda hordonia,** *Stoll* (Plate C., fig. 13 and fig. 11).—Male and female *upperside* black with orange markings. Forewing: discoidal streak broad, anteriorly twice indented, at apex extending into base of interspace 3; posterior discal spots coalescent, forming an irregular oblique, short, broad band; anterior spots also coalescent, oblique from costa; a postdiscal, obscure, grey, bicurved, transverse line and a very slender, also obscure, transverse subterminal line. Hindwing: a subbasal transverse broad band and a much narrower postdiscal band curved inwards at the ends; beyond this the black terminal margin is traversed by a still blacker subterminal line. *Underside* chestnut-brown, covered with short, slender transverse brown striæ on the margin of the orange markings which are similar to those on the upperside but broader, paler and less clearly defined. Forewing: the pale transverse postdiscal and orange subterminal lines of the upperside replaced by a postdiscal lilacine narrow band, defined by somewhat crenulate chestnut-brown lines on either side and a pale subterminal line. Hindwing: the base suffused with lilacine; the subbasal and postdiscal bands bordered outwardly by narrow lilacine bands, the orange-yellow of the postdiscal band much obscured by the transverse brown striæ; the terminal margin with a sinuous, obscure, broad, lilacine line. Antennæ, head, thorax and abdomen black; beneath, the palpi and thorax greyish, abdomen ochraceous In the *dry-season form* the markings are similar, but very much broader; on the *upperside* of the forewing the postdiscal line generally and the subterminal line always clearly defined, the former, sometimes, like the latter, orange-yellow. *Underside* paler, blurred, the transverse short brown striæ in many specimens covering nearly the whole surface of the wings. Exp. 38-54mm.

The orange of the coloured figure is not bright enough, the black not deep enough.

*Egg.*—It is shaped like a sea-urchin but is higher than broad; the surface is covered with rows of hexagonal cells with their bottoms concave and shiny, each angle of each cell bearing an erect, minute, colourless spine; there is a small round depression on the top round which there are 7 of the hexagonal cells, and there are 7 rows between it and the base of the egg. Colour azure-blue. B: about 0. 8mm.

*Larva.*—The body is more or less cylindrical but somewhat thickest at middle; there are small fleshy, short, conical tubercles dorso-laterally on segments 3, 4, 6 and 12; the colour is grey-green with dark green diagonal markings. The head is triangular, the apex rounded; the clypeus small, triangular; dull olive-green in colour with a whitish cheek-stripe; the surface covered with little white tubercles bearing each a very short hair. The body surface is dull and covered all over, as well as the belly, with tiny white tubercles bearing each a short hair; the anal segments have a few short, erect, reddish hairs. Anal flap with tumid extremity, triangular in shape. The first pair of dorso-

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lateral tubercles, on segment 3, are very small ; the next, on segment 4, as also the pair on segment 6, are longer and equal to each other ; the pair on segment 12 are as long as these last but thinner ; all tubercles are set with short erect hairs at their ends. Spiracles are nearly circular, small, shiny dark brown in colour. The markings are as follows : there is a slightly raised subspiracular fold of skin from segment 5 to segment 12, approaching nearest to the base of legs on segments 7 and 8, being slightly curved ; there is a white dorsal line, flanked by dark-green narrowly, from end to end of larva ; the space included between the tubercles of segments 4 and 12, bounded laterally by a line connecting the bases of the former tubercles with the end of the fold on segment 5, then by the fold as far as front margin of segment 9, then by a line connecting this point with the dorsal line at posterior margin of segment 11 is green strongly suffused with grey ; all the body anterior to this space (which may be called the saddle) and segment 8 (on the saddle) is light olive-green getting whitish upwards ; the part of body after segment 8 below the saddle as far as anal claspers is dark olive-green ; there is a black diagonal band along the line separating this dark olive part from the grey-green saddle ; each segment 6, 7, 8, 9 is marked laterally with a dark green diagonal stripe of which that on segment 6 is often the best defined, the succeeding ones becoming more and more indistinct. L : 25mm. ; B : 4mm.

*Pupa.*—The pupa is of the same shape as that of *Neptis jumbah*, though smaller. The thorax is somewhat highly keeled in dorsal line, as also the abdomen in the posterior part ; the wings are expanded laterally, the margin (lateral margin of the pupa) being sharp and slightly waved ; the outer margin of wings is also slightly waved. The front of the head is widely and shallowly concave, sharp edged dorso-ventrally, the vertex is slightly convex, the ascent in dorsal line is slight. The dorsal slope of thorax is at 45° to the longitudinal axis of pupa, the apex the same height as abdomen at segment 6, the wing-expansion curve nearly rising to the same height as the apex of thorax. Cremaster flat and triangular with extensor ridges developed dorsally. Spiracles ordinary in size, roundly oval, raised, dark brown. Surface of body extremely finely rugose with transverse striæ ; segment 5 with a flat, raised, rather large subdorsal surface which is shiny mother-of-pearl ; segment 4 with two such surfaces on each side, one subdorsal, the larger, the other, lateral, much smaller; the thorax has two such raised surfaces in juxtaposition slightly anteriorly on lateral margin, the anterior one the smaller and another just in front of these; segment 2 has one such lateral spot ; the colour of the pupa is green, wings darker, indications of diagonal bands on abdomen. L : 12 ; mm. ; B : 4·5mm., at widest part of wing expansion ; H : 4·2mm.

*Habits.*—The egg is laid on the top surface of a leaflet. The young larva, emerging, cuts the midrib of the leaf nearly through, then cuts the leaflets off at their bases, attaching them by silken threads to their respective places, and cuts the pinnæ through in several places,

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fastening in the same way with silks to prevent them becoming detached and falling to the ground: so that the part of the leaf beyond where the midrib is nearly cut through hangs down laxly and withers. The egg larva cuts through the stalks of a few leaflets at the point of one of the pinnæ as often as not and, as it grows, continues the work. The full grown larva changes its leaf perhaps once or even twice occasionally, treating it each time as above described. It lies on the last pinna, hidden by the leaflets and other pinnæ. It pupates there also. The larva eats the withered leaves as long as they are not too dry. It resembles them in colour very much and there is no doubt that the ruse acts as a protection against predaceous spiders and birds to a certain extent. The pupæ however are much parasitised by ichneumon wasps of small size; the ichneumon laying its eggs in the larva. It would therefore be more correct to say that the latter is parasitised and not the pupa. The butterfly never rises much above the surface of the ground and is a weak flier, generally resting on the leaves of bushes in fairly thick places; and also generally somewhere in the neighbourhood of the foodplant of its larva. The wings are held fully open or slightly inclined to the horizontal when basking in the sun but they are closed over the back in dull weather or when the insect seeks protection. The flight is something after the manner of an *Athyma*, the wings being hardly ever brought to touch over the back though they are raised higher than in that genus between the downward strokes. The insect is very fairly common in places though perhaps not as plentiful as *Neptis eurynome* and it is also perhaps slightly scarcer in open country than that species. There is another larva very much like this one which, however, has the tubercles much more developed, in fact they are large enough to be called spinous processes; the head also has each lobe produced into a small point; the description is as follows:—

*Larva.*—Is like that of *hordonia* in shape and markings and, to a certain extent, also in habits. The head is trapeze-shaped, the narrower end being the vertex, and is divided down the middle by a depressed line; the vertex of each lobe is produced into a short blunt point, the two points not widely separated. The four pairs of fleshy tubercles on segments 3, 4, 6 and 1 are thrice as long as in *R. hordonia* and are directed slightly backwards, the tubercles of each segment are not connected by a ridge as in that species. The spiracles and surface of larva are the same. The colour is: a white dorsal line; the "saddle" on dorsum of segments 4-10 is brown-green or red-brown of varying shades in different

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specimens with similar diagonal lines on segments 3-7 as in *R. hordonia* ; the head and rest of the body are brown apple-green with the subspiracular ridge light, white on segments 11 and 12 ; the first pair of processes or projections are black on the outside margins ; there are white lateral points or lines on segments 2-5 ; a black line from base of each proleg runs up the anterior part of it to the subspiracular ridge which is present also on segments 5 and 6 ; belly lightish green with a fine central dark line ; the colour may vary from light grey-green to dark brown-red green. The length and breadth as for *R. hordonia*.

*Pupa.*—The pupa is not distinguishable from that of *R. hordonia* except that the wing expansion is perhaps slightly more curved up, the sinus in front of head perhaps slightly shallower. Length and breadth and colour as in that species.

*Habits.*—Are like those of *hordonia* but differ in that the larva lives an opener life, not cutting leaflets in the same profusion as that species. It pupates in a similar manner. Both walk in a halting manner.

Which of these two larvæ produces true *R. hordonia* is still a moot point. We have called the first by the name for the time being. It is indeed rather difficult to find any difference between the insects produced by the two, the more so since both butterflies are somewhat variable according to season in colour and heaviness of black markings. The males have a sex-mark on the upperside of hindwing, about the middle of the costal area, which appears to be darker in the second form than in the first. Further breeding will perhaps set the question at rest but at present it is impossible to say with certainty whether we have to do with different species or whether the larva is dimorphic. There seems to be little reason for this latter supposition for the larvæ are found in the same place at the same seasons. The foodplants however differ for, while the first form is found only on *Acacia pennata*, Willd., with numerous small leaflets, the former affects *Albizzia oderatissima*, Benth. and *Acacia concinna*, Dc. also, the latter a similar creeper to the first but growing in damper localities and having less numerous, larger leaflets. *Rahinda hordonia* is spread over Continental India from the Himalayas to Travancore ; Assam ; Burma ; Tenasserim, extending into the Malayan subregion.

*Note.*—For the uninitiated : the leaves of these *Acacia* creepers (all extremely prickly or thorny) are said to be *bipinnate*, that is the midrib bears a series of opposite branchlets or *pinnæ* which bear in their turn the leaflets, also opposite to each other and close together while the pinnæ are widely separated.



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48. **Neptis eurynome**, *Westwood* (fig. 13, underside and Pl. C. Fig. 12, male).—Male and female *upperside* in the dry season are black, with pure white markings. Forewing : discoidal streak clavate, apically truncate, subapically either notched or sometimes indistinctly divided ; triangular spot beyond broad, well-defined, acute at the apex, but not elongate ; discal series of spots separate, not connate, each about twice as long as broad ; postdiscal transverse series of small spots incomplete, but some are always present. Hindwing : subbasal band of even or nearly even width ; discal and subterminal pale lines obscure ; postdiscal series of spots well separated, quadrate or subquadrate, very seldom narrow. *Underside* from pale golden ochraceous to dark ochraceous, almost chocolate ; white markings as on upperside but broader and defined with black. Forewing : interspaces 1a and 1 from base to near apex shaded with black, some transverse white markings on either side of the transverse postdiscal series of small spots. Hindwing : a streak of white on costal margin at base, a more slender white streak below it ; the discal and subterminal pale lines of the upperside replaced by narrow white lines with still narrower margins of black. Antennæ, head, thorax and abdomen black ; the palpi, thorax and abdomen beneath dusky white. Exp. 44-70mm.

The *wet season form* differs only in the narrowness of the white markings and in the slightly darker ground-colour and broader black margins to the spots and bands on the underside.

*Larva*:—The larva is not unlike that of *Rahinda* in shape, but is different in aspect, being much rougher owing to more developed and somewhat densely set tubercles all over the surface ; the place of the points on segments 3, 4, 6, 12 is taken by bent fleshy processes, also set with tubercles, each bearing a short hair, as do those of the body ; these tubercles somewhat flattened and generally curved out and downwards ; being fleshy, they are to some extent erectile ; the pair on segment 4 being more than twice the length of the others, those on segment 6 the smallest ; those of segment 4 are connected by a distinct straight ridge, those of segments 3 and 6 also, but to a lesser degree ; the head is perhaps a little higher than in the second form of *Rahinda hordonia* and the vertex points are somewhat more developed and sharp instead of blunt, and further apart, divided by a rounded sinus, the surface a good deal rougher tuberculate ; clypeus small as in the other ; the surface covered with tubercles, of which one on each side of clypeus-apex and two on middle of face of upper part of each lobe much larger than the rest ; all tubercles of head and body yellowish ; the colour is similar, varying a good deal in shade, generally brown with the saddle suffused with grey, a suffusion of ochreous mottled with brown and with the stripe on the place where the leg is or would be on segments 5, 6, 7. The spiracles are similar, the anal flap tumid, as in that species ; the subspiracular ledge is strongly developed on segments 6, 7, 8, and the tubercles on it longer and thorn-like, though thin ; the dorsal white line is present, though

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thin ; the dark (green, brown or chocolate), lateral region on segments 11, 12, embracing the whole of segments 13, 14 is also here ; the diagonal stripes alone are indistinct above the ridge on segments 4-10 ; there are some greeny white or cream-coloured lines on the ridge below spiracle of segment 11, and very often, some spots or a line of the same colour above it ; but these may be entirely wanting ; the belly is the colour of the dark lateral portion of segments 11-14 with a darker central line except on the front two segments where the colour may be lighter in colour and more approaching that of the "saddle". The length of the processes of segment 4 is 2mm., and all processes are somewhat pronouncedly spiny or tuberculous at extremities. Owing to the long processes the larva looks thickest at segment 4, especially when at rest with its true legs bunched and the front of body from segment 7 forwards raised and bent sharply at segment 5 6, the face turned down, which is the usual position. L : 21mm.; B : 4mm. at middle.

*Pupa*.—This pupa is of the type of that of *Rahinda hordonia* but is larger, broader comparatively, generally stouter, the wings more expanded laterally, their dorsal margins more pronouncedly waved and the rounded tornal angle produced upwards so as to be higher than the general surface of the pupa at segment 6, the terminal margin, therefore, longer here than in that species ; the pupa is broadest at segment 6 ; the head-vertex is perpendicular to longitudinal axis of pupa and separated from the ventral surface by a distinct ridge which is continued to the point of a short, stout, triangularly pyramidal projection pointing out forwards and laterally from each eye : the lateral outline of the pupa being formed by one side of the pyramid, another side making a ridge to the base of antenna ; the head with segment 2 make an oblong solid, the upper surface being the flat second segment, the two prominent eye-projections forming the lower anterior corners, the anterior face, the head-vertex, the under surface being the face of head which is here ventral; the base of each antenna is slightly prominent forming a small tubercular projection pointing forwards; the lateral outline of the pupa diverges from the central axis slightly from the hinder margin of segment 2 to the shoulder, where there is also a small prominent tubercle pointing outwards, the wing expansion commencing immediately afterwards ; the dorsal line of pupa ascends from segment 2 (which is parallel to longitudinal axis) at first at right angles to that axis for a short space, then for about two-thirds the length at an angle of 45° in a slight curve to the apex—the whole slightly carinated, most highly at apex—whence it falls rather suddenly and shortly to segment 4 and so to segment 5, whence it rises again somewhat gently to near hinder margin of segment 6—without carination—then curving down in a quarter circle curve to cremaster—here, again, carinated slightly, the carination being higher at the hinder margin of each segment

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than at the front margin of the succeeding one ; in the ventral line the head is convex, the wing-junction line is straight and the abdomen is curved after the thickened end of wings ; the thorax is humped, that is, convexly prominent, the hinder margin a quarter circle curve meeting the wing-line in a broad, open rounded angle of about 90°. Spiracles of segment 2 indicated by a small oval orange flat surface facing forwards formed by the front margin of segment 3, being raised in a short curve above margin of segment 2 ; the rest of the spiracles oval, hollow, dark brown, rather small. Surface of pupa somewhat shiny, smooth, with a central dorso-lateral rather prominent, conical, small tubercle on segment 6 and an indication of a blunt one on segment 4. The cremaster as in *Neptis jumbah*. The colour of the pupa is a pearly greenish yellowish-white, the thoracic margin, wing-expansions, antennæ, the venation of wings, head-points, shoulders and dorsal line marked with olive-brown ; there is also a brown spot at centre on each side of proboscis inside and a larger one opposite it on the other side joined by a brown line to the origin of veins 3 and 4 on the wing, a fine brown transverse discal line and a similar subterminal line to wing, the terminal margin narrowly brown ; a golden suffusion on abdomen above and below, especially on dorsum of segment 4, resembling mother-of-pearl. L : 9mm. ; B : 6·5mm. across wing-expansion at segment 6 ; 3mm. across head.

*Habits*—The egg is always laid on the upperside of a leaf and generally, at the point. The little larva on emerging, immediately, after eating the egg-shell, proceeds to make a bed for itself upon the extreme point of the midrib, gradually eating pieces of the leaf and leaving it free ; it does not actually eat all the pieces but gnaws a lot free and hangs them by silken threads from its perch. It does not, like *Rahinda hordonia*, gnaw partially through the midrib and live amongst the little pendent pieces, but sits quite openly on its bed. It eats withered pieces of the leaf with apparent gusto like *Rahinda*. As the larva grows it lengthens the free portion of the midrib by eating off more and more surface of the leaf. After the third moult, however, it will generally gnaw the stem of a leaf or leaflet through partially, so that it hangs down and withers, curling in the process : in this it sits, wandering away to feed. The colour of different larvæ varies to match the different shades of withered leaves. The larva is sluggish, walking haltingly and resting very generally with the head turned round on the side and with the face bowed. The pupation takes place on the underside of a leaf or twig, as often as not from a perpendicular branchlet or stalk and the attachment is strong and firm, so that the pupa hangs rigidly : it wriggles when touched. The butterfly has much the same habits as *Rahinda hordonia* and frequents much the same places,

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although, perhaps, it is the commoner of the two. It flies also in the same manner, though somewhat stronger on the wing and rests in the sun with the whole of the upperside visible; it closes the wings over the back when it wishes to hide or during rain, or when it retires for the night. The insect is found throughout the whole of Continental India and Ceylon; in Assam, Burma and Tenasserim, and extends to China and the Malayan subregion. Its foodplants are various species of *Leguminosæ*, *Tiliaceæ*, *Malvaceæ*, botanical families containing Vetches, our English Lime-tree or Linden, and the Mallows respectively. Generally the larva has been found on *Cylista*, *Flemingia*, *Mucuna*, *Xylia* of the first family; *Grewia*, *Triumfetta* and *Corchorus* of the second and *Bombax* of the third. The family *Sterculiaceæ* gives another genus, namely *Helicteres* and the *Oleaceæ* still another *Mappia fœtida*. So there is no lack of foodplants, and no reason why the insects should be limited in its area of distribution.

40. **Neptis columella**, *Cramer*.—Male and female *upperside* black with white markings. Forewing: discoidal streak, widening towards apex; notched preapically on the anterior margin and obliquely truncate at apex spot beyond large, broadly triangular, well separated; discal spots in pairs, varying in size, spot of this series in interspace 1*a* always elongate; spots in transverse postdiscal series obscure, not all well defined, margined on both sides with deeper black than that of the ground-colour; the space between the series and the discal spots and also the terminal margin beyond it with obscure transverse pale markings. Hindwing: costal margin broadly greyish-brown; subbasal band not extending to costa, of varying width; discal and subterminal pale transverse lines, the space between them darker than the ground-colour, traversed by a prominent postdiscal series of spots of varying size. Cilia white alternating with black. *Underside* ferruginous brown; white markings as on the upperside but broader; the pale marking between the discal and postdiscal series of spots, the subterminal markings on the upperside of the forewing and the discal and subterminal pale lines on the upperside of the hindwing represented by pale lunular transverse whitish markings. The costal margin of the hindwing above vein 8 very broad, especially in the female. Antennæ dark brown to black; head, thorax and abdomen dark brownish black; beneath white. The *dry season form* has the white markings generally broader and the ground-colour of the underside brighter. Exp. 66-75mm.

This *Neptis* has not been bred, though it was once, it is thought, seen laying eggs on a creeper of the genus *Dalbergia*.

*Habits*.—There is nothing to distinguish the imago from *Neptis jumbah* in the general habits though it is much more of a jungle insect than that species. It exists in Western and Southern India and is recorded from

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Mahableshwar, Kanara and the Nilgiris; also from Sikhim, Bhutan, through the hills of Assam, Burmah and Tenasserim to the Malay Peninsula, Siam and Sumatra. It will not be found in the true Plains.

50. **Neptis jumbah**, *Moore.*—Male and female similar to *N. columella*, but with the following differences:—*Upperside* fuliginous black, the interspaces between the veins deeper black, very conspicuous in certain lights, particularly so between the subbasal and postdiscal markings on the hindwing; the white markings suffused with very pale bluish green; the posterior two spots of the discal series of the forewing subequal; the postdiscal macular band on the hindwing with a tendency to obsolescence, varying from a narrow series of white lunules to a somewhat diffuse, transverse, narrow pale band. On the *underside* the ground-colour is paler than in *N. columella*, the interspaces between the veins conspicuously much darker; the postdiscal and subterminal markings on both fore and hindwings diffuse and very ill defined. In the female the spots on the forewing and the subbasal band on the hindwing are comparatively broader than they are in the male; in the *dry season form* of both sexes, as compared with the *wet-season form* often conspicuously broader. Antennæ, head, thorax and abdomen as in *N. columella*. Exp. 62-70mm.

*Egg.*—The form is dome-shaped, broadest just above the base; there is a six-sided depression in centre of top surrounded by seven similar six-sided depressions and there are six rows of such depressions from top to base not counting the central top one; the walls of these pits are thin and there is a thin, short, fine spine at each intersection: otherwise at each angle of depression; the bottoms of the pits are concave, shiny and smooth. The colour of the egg is green. The breadth is 1·1mm., equal to the height.

*Larva.*—The body is the same shape as that of *Neptis eurynome*, exactly in every particular, that is, thickest in the middle, though appearing to be thickest about segment 4, where the longest pair of excrescences are. Head is trapeze-shaped seen from in front, the vertex being the shortest side, the lateral lines the longest; the basal line across jaws is slightly curved; the vertex is triangularly indented, each lobe having a short pointed tubercle on the vertex; the surface is set with small, shortly-setiferous tubercles: the colour is red-brown, a dark-brown check-stripe, with a similar line down centre of face splitting down the sides of clypeus. Segment 2 is a good deal narrower than head, and lower. Segment 3 is larger in diameter than segment 2, similar, but with a well-defined dorsal central ridge, ending in a small dorso-lateral, brushy, fleshy tubercle or process, running across it at right angles to the body-axis, the ridge being as long as the larva is broad at that point. Segment 4 has a similar ridge which, however, is a great deal more developed and ends at each side in a long, fleshy, anteriorly and posteriorly compressed process which is shortly haired at tip: these processes curve at first out and then towards each other like a pair of horns, and are as long as the breadth of the body at the point where they are situated. Segment 5 has no processes or ridge. Segment 6 has a ridge parallel to those of segments

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3 and 4 dorsally, but no processes except the abrupt ends of the ridge may be called such. Segments 8-12 decrease gradually in diameter and the last has a short, fleshy, subdorsal (or dorso-lateral) tubercle or process which curves backwards, the two connected by a low ridge and set with short hairs. There is a slight ridge subspiracularly on segments 5-8. Segments 13 and 14 slope quickly in the dorsal line to the narrowly rounded anal flap. Segments 10-12 never rest on the surface the larva is on. Body surface covered with very small, shortly setiferous yellow tubercles. Spiracles oval, black. The colour is rosy brown suffused with smoky dorsally on segments 4-8; ridge dark on the front face, yellow on top; below a line from the lower anterior marginal corner of segment 8 to the base of the tubercles of segment 12, the colour is deep velvety black-red which colour is that of the whole of segments 13 and 14; a smudge of same colour on lateral face of ridge of segment 6; indistinct diagonal darkish bands laterally meeting on dorsum of segment 7 and segment 8, running from base of prolegs of preceding segments backwards; on the black-red portions of segments 10-12 there may be some bright large emerald-green marks which are not often absent; there is a lightish dorsal line; belly a little lighter than segments 13 and 14. L: 23 mm.; B: 4·5 mm. at segment 4.

*Pupa.*—The pupa is very similar in shape to that of *Rahinda* (but broader) and of *Neptis eurynome*. Head and segment 2, nearly square seen from above, broader than long, produced at the two front corners into a ventrally flattened triangularly pyramidal short, broad, stout point, directed out and forwards; the front of head is slightly concavely curved and rather deep dorsoventrally; the dorsum of segment 2 is flat; the wings are expanded gradually from the shoulders to segment 6, the lateral line somewhat concave in centre and ascending gradually until it is higher than dorsum of pupa at that segment: thorax large, carinated in dorsal line, ascending in that line from segment 2 to the prominent though rounded apex, then descending rapidly to hinder margin; a slight dorsal constriction behind thorax; wing surfaces inclined to each other at an angle of 70°; pupa highest at thorax-apex, broadest at segment 6; the dorsal line descends from thorax-apex to segment 6 front margin, then rises suddenly, to descend again gradually in a curve of a quarter-circle to cremaster: the abdomen is lowly keeled in the dorsal line, this keel being higher at the hinder margin of each segment than at the front margin of the succeeding one. Cremaster with strong dorsal and ventral extensor ridges, triangular, at right angles to axis of pupa. Surface smooth, a small boss at spiracle of segment 2 and a subdorsal, conical, sharp tubercle on segment 6. Spiracles oval, black, small, prominent. Colour dark red-brown to yellow-white, generally strongly suffused with gold with a subdorsal gold patch or spot on segments 2, 3, 4, 5. L: 16mm.: B: 8mm.; at segment 6, at head front: 4 mm.; H. at apex of thorax: 6mm.

*Habits.*—The egg is laid at the point of a leaf or leaflet. The larva, emerging, eats the midrib free, attaching bits of leaf by silks to the rib which hang down loose, leaving the point of rib with a little wing

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of leaf-surface on each side upon which it sits; when full-grown cuts off entire leaflets or leaves attaching them to stalk by silks and lives on one of these hanging leaflets or leaves. The pupa is formed hanging from the underside of a leaf or sometimes from the end of the original midrib. The ways of the butterfly are very similar to those of *Neptis eurynome* or *Neptis columella*, but more like the latter in its habit of flying higher up than the former and in its liking for jungly places; it rests in a similar manner. The insect exists in Bengal, Southern India, in Kanara and Travancore, the Nilgiris, Ceylon, Burma, Tenasserim and the Andamans. The foodplants are many, even more numerous than those of *Neptis eurynome*. It has been found on many *Leguminosæ*, mostly trees such as *Xylia dolabriformis*, *Pongamia glabra*, shrubs and creepers such as *Dalbergiæ* and *Wagatea spicata*; on *Malvaceæ*, such as *Bombax malabaricum*, *Thespesia populnea*, *Hibiscus*, &c.; *Tiliaceæ* such as *Grewia*, *Elæocarpus*, *Rhamnaceæ* such as *Zizyphus*, &c.

**51. Cyrestis thyodamas,** *Boisduval* (Plate C., fig. 11).—Male and female *upperside* white, in many specimens, pale ochraceous yellow, veins black. Forewing with four very slender, irregularly sinuous transverse black lines, the costal margin shaded with ochraceous at base and fuscous beyond; cell crossed by three or four additional fine short lines; a postdiscal very incomplete series of white-centred broad fuscous rings in the interspaces, tinged with ochraceous near the tornus and broadly interrupted in interspaces 3 and 4; beyond this two transverse black lines not reaching the dorsal margin, shaded with fuscous between; a pronounced subterminal black line; terminal margin black, the area between lilacine-grey; cilia grey; the apex broadly shaded with fuscous. Hindwing with three transverse fine lines; a pair of postdiscal, broad, black lines shaded with light sepia-brown between, forming a conspicuous band, the outer line broken and incomplete, followed by two irregular fine black lines, a subterminal more pronounced black line and, posteriorly, a narrow black terminal margin; dorsal margin broadly fuscous at base; apical half and the tornal area and lobe rich ochraceous with some sepia-brown and black markings. *Underside* similar, the markings of the upperside showing through by transparency; the ochraceous shading on tornal area and dorsum of hindwing of less extent but the tornal lobe darker ochraceous with a central round black spot. The markings both on under and upperside vary little in depth of colour and breadth. In many specimens there is a diffuse fuscous spot between the discal pair of transverse fine lines on forewing. Antennæ, head, thorax and abdomen with dorsal and lateral black lines; white below. Exp. 48-70 mm.

*Egg.*—Is highly dome-shaped, almost conical, ridged longitudinally, with an

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aperture at the top fitted with a deeply dentate flat cap like a cogged wheel, the cogs fitting into corresponding openings round the top of the body of the egg, the resulting teeth between the openings being the tops of the longitudinal ridges. The colour is a greasy shiny yellow. The length would be slightly over 1mm

*Larva* (Pl. 1., fig 7).—The form of the larva is spindle-shape, with a pair of outward curved long horns on the head, a long, recurved, dorsal horn on segment 6 and another, curved forwards, on segment 12 ; the colour is dark brown with a broad spiracular yellow band on segments 7-14. The head has the face flat, the surface tubercular-rugose, each lobe having a long, outwardly curved horn, in the same plane as the face, on its vertex ; these horns first diverge slightly and strongly and are separated at base by a small semi-circular sinus ; they are twice as long as the head is high, their surface as well as that of the rest of head set with small black setiferous tubercles ; colour of head and horns brown-black, a line down centre of face as well as the back and inside face of horns light brown ; a greenish-white cheek-stripe. Segment 2 narrower than head ; so is segment 3 ; rest of body is thicker than the head is broad, very slightly broadest in the middle ; anal end somewhat narrowed, the anal segment sloping dorsally considerably, square at extremity ; segment 6 has a very stout, recurved, dorsal horn pointing backwards, longer than the body is high and covered thickly with small conical setiferous tubercles, those on the posterior face being longer and spine-like ; segment 12 has a similar horn, directed slightly backwards but curved forwards, the tip slightly recurved tubercled throughout its length, the posterior tubercles longer ; both these horns (on segments 6 and 12) are dark brown in colour with a yellow annulus before the point. Spiracles roundly oval, large, nearly flush, light brown in colour. Surface of body covered with small, shortly setiferous tubercles, the tubercles black on the body and yellow on the yellow spiracular band. Colour of the body dark brown with a broad yellow-green spiracular band from the front margin of segment 7 to the end of larva, commencing broad and thinning posteriorly ; belly watery reddish brown. L : 33 without horns, 36 mm. with ; B : 4mm ; L. of head-horns : 4·5mm ; of horn on segment 6 : 5mm; of that on segment 12 : 5mm.

*Pupa* (Pl. I, fig. 7 a.)—The pupa is a mixture between those of *Apatura camiba* and *Moduza procris* in shape but has two long head-processes starting out straight in front in the same plane as ventrum, curving up strongly towards dorsal plane, slightly separated from each other at origin and at extremity but closely applied to each other throughout most of their length; they are conical at base, cylindrical afterwards and are set with minute tubercles, especially near the tips. The thorax is highest near its hinder margin, slightly keeled in the dorsal line, this line descending at 45° to longitudinal axis of pupa towards segment 4 to rise slowly from anterior margin of segmetn 6, then rapidly from hinder margin of that segment, nearly perpendicularly to its former course, to the anterior top angle of a trapeze-shaped, laterally flattened expansion of the dorsal keel over segments 7 and 8, of which the posterior edge, parallel to the



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anterior, is longer than the same and curves into the dorsal abdominal carina behind, this carina soon merging into the dorsal surface: thus making the abdomen appear somewhat laterally compressed ; the abdomen is slightly curved, decreasing gradually in diameter from segment 8 to end ; the cremaster and segment 14 are flattened dorsally and ventrally and curved with a depressed elliptically shaped surface dorsally, at the extremity of which are fixed the little hooklets for suspension ; the ventral line is straight from head to segment 12 ; wing surfaces meet at a very obtuse angle and their dorsal edges are expanded very slightly from shoulders to segment 7, commencing gradually ; the body is thickest at middle of thorax. Body surface more or less smooth, slightly shiny. Spiracles not small, oval, ordinary. Colour of body is an olivaceous brown grey, finely veined darker ; sometimes red-brown. L : 22mm. over all ; of head-process : 4mm. ; B : 5mm.

*Habits.*—The little egg-larva opens the cap and emerges : does not eat the egg-shell and lives on the underside of the leaf in much the same manner as the larvæ of *Athyma* or *Moduza*, *i. e.*, it eats the leaf along the midrib at the tip generally, but sometimes along a side-rib from the edge inwards. The egg is, by the way, nearly always deposited on the underside of a young leaf. The larva does not always lie on the free rib thus left, though it sometimes does so ; it eats voraciously, and therefore grows rapidly. The pupa is formed under a leaf or suspended from a stalk or twig, hangs perpendicularly down and is strongly attached. The trees chosen for laying are large trees in young leaf as a very general rule, and the larva eats young leaves only. The places chosen are fairly damp, airy localities in the jungles, generally in more or less open spots, that is, where the jungle is not too thick, in fact, in such spots as are favourable to the growth of the foodplants. The perfect insect flies mostly with its wings horizontally stretched keeping them in this position for a longer time between strokes than any other butterfly we know ; it is a somewhat frail insect, rather weak of flight, though quick enough on the wing to escape or avoid capture with a certain ease, and invariably rests with its wings widespread. It flies very high at times and may be seen round the tops of very tall trees; but the flight is not sustained, indeed it may be said never to fly far. It rests on the tops of leaves in the day-time, and is fond of the checkered shade on sunny days; it often comes to the ground on roads, paths and in beds of nalas to suck moisture in hot weather and is occasionally found at flowers. The butterfly is not found in the plains, but exists

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everywhere in the jungle-clad hills from sea-level upwards. The distribution is said to be Continental India generally, from the Himalayas to Travancore in the hills, avoiding the hot dry plains of Northern and Central India; Assam, Burma, Tenasserim, extending to China and Japan. The food-plants of the larva are certain fig-trees; those upon which it has been found are *Ficus religiosa*, Linn., the *Asvath* or *Pipal* and *Ficus bengalensis*, Linn., the common Banyan or *Wad*, both trees distributed throughout India and well known to everybody. There are three other species of *Cyrestis* known to the Indian Fauna and others in the Austro-Malayan region and Africa.

**52. Junonia iphita**, *Cramer* (Plate A, fig. 6).—Male and female *upperside* brown of varying depths of colour. Forewing: with one pair of subbasal and one pair of apical, transverse, sinuous fasciæ, the outermost defining the discocellulars; a short, broad, oblique fascia beyond to vein 4, its inner margin diffuse, its outer sinuous, but sharply defined; below vein 4, a sinuous transverse fainter fascia, followed by a discal blackish fascia, very broad and diffuse; below costa, bordered by a row of faint ocelli and a postdiscal and subterminal similar fasciæ following the contour of the termen. Hindwing with a slender blackish loop near the apex of cellular area; a broad inwardly diffuse, outwardly well-defined, short discal fascia in continuation of the one on the forewing; a series of postdiscal somewhat ochraceous ocelli with black pupils minutely centered with white; postdiscal and subterminal broad lines as on the forewing. *Underside* brown with very broad darker brown fasciæ, the interspaces between the markings irrorated with purplish silvery scales. Forewing with two sinuous fasciæ on the basal half followed by a discal fascia, very broad at the costal margin and decreasing in width to the dorsum, bearing on its outer border a row of obscure ocelli. This is succeeded by a zig-zag dark line and sinuous subterminal and terminal lines; apex and tornal area suffused with purplish silvery. Hindwing: two irregular dark brown, very broad, curved short fasciæ near the base; a straight, transverse, prominent, narrow ochreous-brown discal band defined outwardly by a black line; a transverse postdiscal dark-brown fascia, widest in the middle and bearing outwardly a curved row of ochreous-brown, white-centred ocelli, followed by a zig-zag dark line in continuation of that on the forewing; a subterminal somewhat diffuse dark fascia and a terminal dark line Antennæ, head, thorax and abdomen dark brown. The ground colour and even the markings vary in shade, some specimens being almost ochreous-brown, the ocelli often ochreous-ringed on the underside; the transverse discal fasciæ on the hindwing with one or two subcostal white spots, that in interspace 7 often large, and occasionally there is one in the same position on the subbasal transverse band. The *wet-season* insect, that is, the one appearing in the very

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wet months, is darker in shade than the *dry-season* specimens, and fresh individuals of that form often have the purplish silvery markings bright burnished steely blue in colour. The female also on the whole seems at all times to be lighter in shade than the male, especially on the underside. Exp. 56-77 mm.

*Larva.*—The shape of the larva is cylindrical, the anal end rounded and high: the body is set with seven longitudinal rows of spinous softish pedicels, one of each row to each segment 3-12. The head is square from front view, the face somewhat convex, divided into two lobes by a considerably depressed central line ; surface covered with small white and yellow conical tubercles bearing each one hair, one tubercle on the vertex of each lobe being much larger than the rest and yellow, bearing a long hair ; colour black-bronze with the vertex reddish. Segment 2 is not much narrower than the head and has a row of longish, erect, forward-curved hairs and a spiracular pair of small spiny tubercles above the base of the legs which (the tubercles) are about 1 mm. in length. Segments 3 and 4 have got these tubercles at bases of the legs also ; segments 5 and 6 have got them in the place where the legs ought to be but here they are both at the same height instead of one below the other as in segments 2-4 ; segments 7-10 have them like these latter, segment 11 like the former. Segments 5-11 have a dorsal, subdorsal, lateral and spiracular spine-bearing pedicel, segments 3 and 4 only a subdorsal and lateral one, segment 12 has two dorsal ones, one near front margin, one near hinder margin (all the other segments having them in the centre) besides the subdorsal, lateral and spiracular ones; the 13th segment is plainly visible and has the subdorsal pedicels only ; the anal segment only the lateral pedicel near the hinder edge. All the pedicels are swollen at base, of equal length except the ones at the bases of legs which are smaller ; the spines are hair-like and disposed irregularly along the pedicels and each pedicel ends in a fine, conical hair-like spine with thickened base. Spiracles are rather small, shiny black, oval, raised. Surface of body covered with minute, conical, white tubercles giving it a velvety appearance. The colour is black and, when full grown, it is laterally reddish brown with an indistinct lightish spiracular line ; dorsally, when full-grown, also, it has a reddish brown tinge with a yellowish shade because of the tubercles between the subdorsal pedicels of each segment ; belly same colour as back ; pedicels dirty watery yellowish, colour of spines brown. L: 38 mm.; B: 7 mm ; L. of pedicels : 2 mm.

*Pupa.*—The pupa is of very ordinary nymphaline shape with slight conical protuberance in front of each eye, the surface with a few small conical tubercles the colour dirty grey-brown in shades. The head is square in front and blunt dorso-ventrally, each eye having a small conical tubercle in front of it pointing straight out in front ; the lateral outline of pupa slopes slightly outwards from head to shoulders, then hardly at all as far as segment 7-8 after which the abdomen narrows to cremaster. The dorsal slope of segment 2 and thorax is the same and is about 45° to longitudinal axis of pupa ;

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the thorax is somewhat decidedly convex ; the constriction behind is dorsally considerable though wide, laterally very little ; the wings are not expanded at all ; on the shoulder is a slight transverse ridge and a short way behind is another ridge, below the wing-margin, at right angles to it. Spiracle of segment 2 narrow, raised, small, reddish ; the rest small, oval, raised slightly, light brown in colour. The stoutest part of pupa is about front margin of segment 7 and the height at apex of thorax is about equal to the breadth there. Surface smooth, finely aciculate (as if scratched with a needle), very slightly shiny ; a lateral small conical tubercle on thorax ; a dorsal one on its apex ; a dorsal, subdorsal, and lateral row on abdomen, one of each to each segment : none of them prominent, some obsolescent, especially the posterior ones. Cremaster stout, the dorsal transverse section semicircular with two strong ventral extensor ridges. Colour a grey or dirty brownish-black ; a light spot on top of head and another on each side of front of thorax. L : 18mm.; B : 8mm.

*Habits* —The egg is laid among the young leaves, either on top or on the underside, really anywhere. The young larva commences feeding on the young leaves, lying among them generally putting out a few silks to protect itself by drawing the edges of leaves together although this is done in a very perfunctory manner. When full grown the larva lives anywhere on the plant : on the leaves, on the stem, anywhere. It is sluggish in its movements and drops to the ground, curling up when disturbed (so does the young one when handled or touched) but not by a silk. The pupation takes place generally somewhere near the ground on the underside of a leaf, from a stick, from the underside of a ledge of rock, &c., and the colour harmonises well with the surroundings of withered leaves, dead sticks and stones. The pupa is not particularly firmly attached, or perhaps it would be more correct to say that it is not rigidly attached for it hangs loosely and swings from side to side, but never falls off. The butterfly is one of the commonest insects throughout India both in the plains and hills from sea level upwards. Like all its near relations it does not rise much above the ground though it can fly quite a long distance at times. It is generally seen basking in the sun low down on a leaf with its wings half or wholly open and it does not frequent the ground as much as the other members of the genus. The flight is rapid, of the *Neptis* type at times, but more decided and much stronger. The insect rests with its wings closed over its back at night and, really, at all times when frightened and not actually basking or playing about. The larva feeds on a great

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number of plants of the family *Acanthaceæ* which is an order confined to the Tropics and containing some species which grow in great profusion where they exist, sometimes covering the ground for miles and miles with a dense growth of plants fifteen feet high and more (*Strobilanthes callosus* and others of the genus) in the hilly parts of India. Some of the species upon which the caterpillar has been found are *Strobilanthes callosus*, Nees.; *Justicia micrantha*, Heyne: *Asteracantha longifolia*, Nees., &c. The distribution is given as throughout Indian limits, extending to China and Sumatra.

**53. Junonia lemonias,** *Linn.* (Plate A, fig. 3).—Male and female *upperside* olive-brown. Forewing with four sinuous, short, black transverse bars across cell-area, the outermost defining the discocellulars; the space between the middle pair of these bars, two spots beyond the apex of the cell, an outwardly angulated, sinuous, discal series of spots, a postdiscal interrupted series of similar spots, yellowish or light ochraceous; also an ochraceous inner, subterminal, anteriorly broken line, inwardly margined with dark brown; a large discal black blue-centred, reddish-ringed ocellus and a much smaller, very obscure, brown, subapical ocellus between the discal and postdiscal series of spots; finally a dark brown terminal line following the outline of the margin. Hindwing with a slender black loop in the apex of cell-area, a large ocellus similar to the discal one of the forewing across interspaces 4, 5 and 6, often with its outer rings enclosing a much smaller ill-formed ocellus anteriorly; postdiscal, subterminal and terminal dark brown somewhat lunular lines. *Underside* in the *wet-season form* ochraceous brown. Forewing: basal half crossed by three broad, pale, dark edged, sinuous bands, beyond which the angulated discal, the postdiscal, subterminal and terminal markings of the upperside show faintly through; the discal ocellus as on the upperside but not so clearly defined and without the blue centre. Hindwing with three or four sinuous, ill-defined, band-like, pale markings on the basal half, the outer faint bands coalescing; followed by a postdiscal dark broad band traversed by a row of minute dots interrupted by two large black ocellar spots, and a faint subterminal, lunular, brownish line. In the *dry season form* the ground-colour is ochraceous yellow, often ochraceous red, the markings more obscure, the two large black ocellar spots reduced to the size of the others in the row. Antennæ, head, thorax and abdomen dark brown; beneath, the palpi, thorax and abdomen pale dull ochraceous. Exp. 56-62 mm.

*Larva.*—The shape and arrangement of spines is the same as that of *J. iphita* exactly. The head is bilobed, roundish, with the sides more or less parallel to each other; shiny metallic dark blue in colour with a stout short tubercle on vertex of each lobe. The colour of body is pale black with a deeper black dorsal line; there is no subspiracular line; all the tubercles or pedicels of spines are metallic blue, the spinules dark; the two tubercles or spines in front of spiracles of segment 2 are red-yellow as is also the neck. Surface of body

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covered as usual sparsely with minute, whitish, setiferous tubercles. Spiracles oval, dull black, flush, of ordinary size. L: 36 mm.; B: 7 mm.

*Pupa.*—There is nothing much to distinguish this from that of the preceding species in colour or size so that no particular description has been kept.

*Habits.*—The habits of the larva are much the same as those of *J. iphita* and the method of pupation and choice of locality also. The style of flight of the imago is also similar as well as the other habits. This species is, perhaps, less fond of absolute plain country than either *J. orithya* or *J. hierta* and is certainly not as numerous as any of the other species where they are found; it is more an insect of the jungles than any of the others except *J. iphita*, though this does not mean that it is anywhere confined to those jungles. The foodplants—for there are probably many—all belong to the same family as those of the last species. Plants the caterpillar has been found on are *Nelsonia campestris*, R., and *Asteracantha longifolia*, Nees., the former a diffuse herb spreading over considerable areas in the jungles, with sticky or glutinous leaves and flower-bracts, the latter a herbaceous plant growing in damp places, with whorls of sharp thorns, lanceolate leaves and blue flowers, very common; both of them distributed throughout India as is also the butterfly.

**54. Junonia atlites,** *Johansen.*—Male and female *upperside* pale lavender-brown, apical half of the wings paler. Forewing: cell with three transverse, short, sinuous, black bands, the outermost defining the discocellulars; a similar short, somewhat broader band beyond apex of cell; two transverse discal dusky black fasciæ, the inner highly sinuous and outwardly angulate above vein 4, the outer straighter, somewhat lunular, bordered by a series of whitish ovals with dusky or black centres; the black-centred spots in the interspaces 2, 5, 6 margined inwardly with rich ochreous yellow. Beyond this series of ovals is a lunular narrow transverse dark band followed by sinuous subterminal and terminal dark lines. Apex of wing and terminal margins, more or less broadly, slightly fuliginous; cillia grey. Hindwing: a short slender black loop from vein 6 to 4 at apex of cell area; two discal sinuous transverse dark-fasciæ in continuation of those on the forewing; followed by a series of dark-centred ovals in interspaces 2-6, those in interspaces 2, 5, 6 with dark centres inwardly bordered broadly with ochreous yellow; postdiscal, subterminal and terminal dark lunular lines as on the forewing. Cilia grey. *Underside* lilacine white, marking as on the upperside but very delicate, slender and somewhat obsolescent. In the *dry season form* of the male the rows of oval ocelli are only indicated by the yellow-centred ovals. The most prominent marking is the inner discal fascia across the wings; this is much less sinuous than on the upperside and not angulated on the

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forewing. In the females the markings are all heavier and more distinct, the space between the various transverse fasciæ tinged with ochraceous. Exp. 55-66 mm.

*Egg.*—The egg is barrel-shaped, with thirteen longitudinal ridges from top to base parallel to each other and not continued on to the flat top ; these ridges under the lens are finely beaded and are thin, being one-fifth as broad as an interspace at the middle of the egg ; the flattish top has a small white ring in the centre—the micropyle ; the surface is otherwise shiny and smooth ; the colour is dark green with all the ridges white.

*Larva.*—The larva resembles in shape that of *J. iphita* or any other member of the genus, the position of the spinous pedicels is also the same. These spinous pedicels are : on segment 2, below the spiracle, on base of leg, two of them, one above the other ; two at the same height, beside each other, on segments 3 and 4 in the same position ; a triangle of three on segments 5 and 6, where the base of the leg would be : two in a horizontal line and one below ; two in a line on base of pro-legs of segments 7-10 ; two one below the other on segment 11 ; and a single one, subspiracular and slightly larger, on segments 3-12; all, except these last, dirty watery-white in colour and set with fine white hairs as long as the pedicels in the subspiracular line ; beside these pedicels there are : a dorsal, dorsolateral, supraspiracular pedicel on segments 5-11 ; a dorsolateral and supraspiracular one on segments 3 and 4; a dorsolateral pedicel on segments 13 and 14 ; two dorsal ones on segment 12, one near front margin, one near hinder margin, as well as a dorsolateral and supraspiracular one ; all these pedicels above the subspiracular ones are of the same length, just under 2mm., are shiny blackish in colour and have two whorls of dark yellow-brown spinelets on them, these spinelets being nearly as long as the pedicels themselves ; segment 2 has ten simple, slightly-forwards curved spinous hairs along the front margin, black and rather long. Surface of body is soft looking and covered besides with 1mm. long fine, pure white hairs, each hair springing from a minute, pure white, circular tubercle (in these hairs lies the difference from all other *Junonia* larvæ mentioned). A narrow dorsal line and the whole dorsum of segment 3 have no white hairs. Spiracles are oval, black, with shiny borders. The anal flap is nearly semi-circular in outline and somewhat thickened at extremity where it is yellow-ochreous in colour. Head rather small, squarish, the vertex indented triangularly, making it somewhat bilobed ; the vertex of each lobe bears a conical, shining, ochreous tubercle surrounded by three or four small ones, each bearing a hair ; the hair of the large one always long and white ; another small tubercle in the centre of each lobe-face ; some stiff black hairs on upper part of face, some soft white ones about the base ; colour of the head dark bronzy blackish brown with rather a large, triangular black clypeus ; labrum colourless ; basal antennal joint ochreous, second joint blackish. Neck dull greenish black. The colour of the body is velvety black looking, under the lens, somewhat shiny greenish-black ; abdomen lighter blackish ; a subspiracular band sending a short spur up and forwards in front

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of each spiracle, legs and prolegs all brownish ochreous. The whole larva appears frosted-white on account of the presence of the small white hairs. L: 40mm.; B: 5mm.

*Pupa.*—The pupa is almost exactly the same shape as that of *J. almana* in every way; it differs mainly in the colour which is a dull light brown throughout with the front faces of the tubercles somewhat darker and the hinder faces somewhat lighter than the ground-colour; head-points, apex of thorax and cremaster dark brown; hinder half of segment 8 lighter than ground-colour; the apex of thorax is more pointed than that of *J. almana* being a conical point; the anterior dorsal slope from apex to front of pupa is straight instead of convex as in that species; the cremaster is smoothly triangular and has no tubercles; the whole pupa is slighter. Spiracles of segment 2 indicated by a small semicircle of a light red-brown colour on the surface of front margin of segment 3; the other spiracles are rather narrow, black, somewhat raised ovals. The body is somewhat constricted about segment 5. L: 17·5 mm.; B: 6·25 mm. at shoulders and at segment 8.

*Habits.*—The habits of the full-grown caterpillar are very similar to those of *Junonia orithya* in that it feeds upon low or procumbent plants and is generally found lying full-stretched on a perpendicular stem or stalk. The egg is laid on a stalk of grass, on the dead stem of a plant, anywhere in fact as the foodplants grow in great abundance in the spots chosen for ovipositing; the little larva finds the proper plant without any trouble and lies on the undersides of the leaves low down, and drops to the ground curled up when touched, remaining for a considerable time in that position before it regains confidence to move again. The pupa, as a rule, is affixed to a stem or leaf in some thick place, where the plants are close together and mixed with many other species, and, like the larva, is not easy to find. The butterfly moves very much like the other members of the genus, keeping much to the ground, and is fond of visiting flowers; it is a somewhat weaker insect than any of the other species, and is not found much in the jungles, keeping chiefly to the open rice-fields and cultivated lands, especially where the ground is moist in the neighbourhood of tanks and ponds; it is commoner at sea-level from Thana southwards in the Bombay Presidency than anywhere else and is scarce in the jungles of the hills. The distribution is the Terai at the foot of the Himalayas from Kumaon to Sikhim; Eastern Bengal; Central Provinces; Kanara; Ceylon; Assam; Burma; Tenasserim; extending into the Malayan subregion. The foodplants are acanthaceous like those of the other members of the genus; those the larva



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has been found on are *Asteracantha longifolia*, Nees., and a species of *Barleria*.

**55. Junonia orithya**, *Linn.* (Plate A, fig. 4 ♂, 4*a* ♀).—Male *upperside*; somewhat more than half forewing from base velvety black, apical half dull fuliginous; cell area with or without two short transverse orange bars; a blue patch above the tornus; the outer margin of the basal black area obliquely zigzag in a line from the middle of costa to the middle of vein 3, thence straight, then incurved to middle of dorsal margin; just outside it, between veins 2 and 3, a large ocellus, often obscure and surrounded by a margin of the basal black area, sometimes prominently ringed with orange-yellow. Beyond basal black area is a broad, white, irregularly oblique, discal band followed by a short, oblique, preapical bar from costa; a small black orange-ringed ocellus beneath the bar; a subterminal continuous line of white spots in the interspaces and terminal jet-black, slender line, appearing double in some specimens; cilia alternately dusky black and white. Hindwing blue-shaded with velvety black towards the base; a postdiscal black and white or blue and white-centred orange, black-ringed ocellus in interspace 2; another, minutely white-centred or not, similar to this or completely black, round or oval, sometimes completely wanting, in interspace 5; the termen narrowly white bordered inside by a black line limiting the blue area and traversed by a slender black line parallel to the black termen; cilia white. *Underside* forewing: basal half with three black-edged, sinuous, broad, ochraceous-orange transverse bands, followed by a pale discal band; ocelli, preapical bar, subterminal and terminal markings, much as on the upperside; the discal band margined inwardly by a broad, black angulated line, which follows the outline of the black area of the upperside, here replaced by pale grey. Hindwing irrorated with dusky scales on a greyish ground, crossed by transverse subbasal and discal, slender, zigzag, brown lines and a postdiscal dark shade on which are placed the two ocelli as on the upperside; and sometimes a black dot in each interspace 3 and 4; subterminal and terminal faint brown lines and a brownish short streak tipped black at the tornal angle below the lower ocellus. Female similar, with similar but more clearly defined, larger ocelli and markings; the basal half of wings on the upperside fulliginous brown, the blue on hindwing sometimes obsolescent, though this is only found in specimens from dry regions, those from places of heavy rainfall always having the blue developed. Antennæ brown, the upper surface white in the males; head reddish brown, thorax and abdomen above black; palpi, thorax and abdomen beneath dull white. Exp. 49-62mm.

*Larva.*—The caterpillar is of the same type as the rest of the genus. Head roundish, bilobed, each lobe surmounted by a short, equilateral, conical tubercle, the two diverging; surface shiny, covered with small, white, truncated-conical tubercles from each of which arises a curved, shiny, black, rather long, stout hair; the lobe-vertex tubercles, have lateral spinules or bristles; clypeus of ordinary size, triangular, with the apical third orange; basal antennal joint light, second joint, black; colour of head otherwise black.

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Segment 2 has a row of six tubercles on the front margin of which the lowest, subspiracular, is the longest and stoutest; the next is the smallest and situated in front of spiracle; the subspiracular and spiracular tubercles are yellow, the rest shiny black and spined. Segments 3 and 4 have a dorso-lateral supraspiracular and subspiracular tubercle or spine-bearing pedicel; segment 12 is similar but has 2 dorsal pedicels, one near hinder margin, one near front margin; segments 13 and 14 are each provided with a dorso-lateral pedicel. Segments 5-11 are similar to segments 3 and 4, but have a dorsal pedicel in addition. The little spines on the leg-bases are the same as described for *J. atlites*. All the pedicels are stout, longly conical, rigid, about 1 mm. in length and covered sparsely with irregularly disposed spinelets: all shiny blue-black, the extreme bases of the front subspiracular ones of segments 3 and 4 ochreous. Spiracles are large, oval, raised with light centres and shiny black borders. Body surface covered with minute erect, black hairs. The colour of the larva is leaden black, with the neck orange; a jet-black, narrow, dorsal band, spotted finely with white; a white dorsolateral and supraspicular small spot on the hinder margin of each segment; the bases of supra and subspiracular orange-surrounded tubercles are bordered above with yellowish white; there is a yellow-white, narrow band running along and beneath the subspiracular tubercles the whole length of body; the whole spiracular region is sparsely spotted with white: all these white spots mentioned are tubercular, that is, are slightly raised and each bears a little hair; true legs shiny black; prolegs blackish with an orange shade; the belly is blackish purple. L: 30 mm.; B: 5mm.

*Pupa.*—Pupa is very much like the rest of those of the genus. It is perhaps somewhat slenderer than those of *J. almana* and *J. iphita*. It is more or less concolorous, being a slatey dull grey all over. In size it is somewhat smaller than the other species.

*Habits.*—The larva has the habits of the genus; the full grown larva is found in the early mornings lying along the stalks and stems of upright plants in the places where its foodplant exists, for the plant or plants it feeds on are generally fairly abundant in those localities; it probably feeds mainly at nights and retires to some hiding place amongst the leaves and stems on or near the ground during the heat of the day. The pupa is formed generally against the side of a stone or rock low down, sometimes from a stalk or leaf, but this, it has been observed, more rarely: this is due probably to the perishable nature of the foodplants. The butterfly is found most commonly in the open plains, frequenting chiefly flat, stony, more or less uncultivable lands, especially flat, wind-swept, low plateaux of the plains. It is a strong, fast flier, but rarely rises high above the ground, where it invariably rests; nor does it fly far at any time.

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It is, like most of the *Junoniæ*, fond of visiting flowers and the female oviposits generally on leaves lying on the ground or very close to it or on flower-heads, the foodplants being small, low or procumbent or creeping herbs, some of them with very hard, rough leaves. These plants are all belonging to the family *Acanthaceæ* as usual for the genus ; and those of them upon which the caterpillar has been found are *Justicia procumbens*, Linn.; *Justicia micrantha*, Heyne and *Lepidagathis prostrata*, Dalz.; this last growing on bare rocks in extensive patches, the second on paths in fields and open places, slightly taller and less creeping than *Lepidagathis* and more succulent, with little mauve flowers ; the first somewhat similar, flowers pale violet-pink ; all of them very common in Western India ; *Justicia procumbens* spreads to Ceylon, Malay, and Australia, *Lepidagathis* occurring also in the sub-tropical Himalayas. The distribution of the butterfly is India, Ceylon, Assam, Burma, Tenasserim, extending to China and the Malayan subregion.

**56. Junonia hierta**, *Fabricius* (Plate A., fig. 2, ♂).—Male *upperside* bright yellow. Forewing : the costa with a broad triangular projection downwards at the discocellulars, which may be sometimes wanting, the apex broadly, the terminal margin and the dorsum with a triangular projection upwards near the tornus, jet black ; this black margin narrows near the middle of the termen and bears, on the apex, two short, transverse, preapical white streaks crossed by the black veins, below the inner one, an obscure ocellus which may be sometimes wanting. Hindwing : anterior half, and the terminal margin black, the dorsum broadly shaded with ochraceous brown, the anterior black area with a large brilliant blue central patch. Cilia of both wings, white alternated with brown. *Underside* : forewing pale yellow ; cell crossed by three black margined orange-yellow bands ; beyond the cell a short, broad, irregular, jet-black (sometimes dusky-brown) oblique band from costa to base of vein 4 ; apex and dorsal margin broadly, termen in the middle narrowly dusky brownish black with some obscure paler markings ; a round jet-black discal spot in interspace 2 and another smaller one in interspace 5. Hindwing greyish yellow ; in the *dry season form* strongly irrorated with dusky scales ; a prominent transverse brown discal fascia, its margins highly sinuous, a broad brownish shade on the middle of termen ; some obscure lunular marks on the basal area, a postdiscal line of minute dots, in the *rains form* sometimes becoming ocellus-like, subterminal and terminal zigzag slender lines, pale brown. Antennæ pale, head, thorax and abdomen dark brownish black ; beneath dull ochraceous white. Female similar, the colours duller. *Upperside* forewing : cell with a more or less complete black fascia and another at the discocellulars ; blue-centred, well-marked ocelli in interspaces 2 and 5 on the disc of the fore-

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wing and smaller ocelli in interspaces 2 and 5 on the disc of the hindwing. Fore and hindwings with a fairly well-defined subterminal pale line, the blue spot on the anterior black area of the hindwing smaller, with a lilac shade and more ill-defined or entirely wanting ; the rest as in the male. *Underside* as in the male, but generally with the markings heavier and more clearly defined. Exp. 50-58mm.

*Larva.*—The caterpillar is similar to those of the other *Junoniæ* in shape and in the disposition of the spines. Head covered with minute, conical yellow tubercles, each bearing a seta on the summit, some few setæ rather longer than the rest, some few tubercles on vertex of each lobe slightly larger than the rest, one in particular larger, yellow, bearing a long white seta on it ; colour brown-yellow suffused with black in front ; inside the semi-circle of eyes it is also black. The anal flap ends in a "boss" which is rugose. Spiracles black, shiny, oval. Surface of body covered with very minute, shortly setiferous, conical, yellow, tubercles. Segment 2 has a subspiracular longish pedicel, a small supraspiracular one and a row of four small, setiferous black tubercles down the centre on each side. The colour of the body is light greenish-brown, the major part of dorsum of segments 3 and 4 velvety black as also the hinder part of segment 2, there being a double yellow line behind the black of each segment, this yellow broadest on segment 3 ; a sometimes obsolescent black dorsal line ; a blackish patch round the bases of subdorsal tubercles of segments 6-12 ; belly concolourous with dorsum ; all the spinous pedicels (nearly equal in size, about $\frac{1}{3}$ breadth of head) are black in colour set with sparse brown spinelets ; all the true legs and prolegs are dirty light brown, the former with black claws. L : 37mm. ; B : 6mm.

*Pupa.*—Is long and rather narrow, coloured a sort of greyish brown-red. Head, segment 2 and thorax together have the same dorsal curve from front of pupa to apex of thorax, that is, that part of the pupal dorsal line is inclined at about an angle of 45° to the longitudinal axis ; the thorax is somewhat humped and evenly convex ; constriction behind thorax very moderate ; abdomen circular in transverse section, thickest at segment 7, gradually decreasing to end, the two last segments—segments 13 and 14—being nearly at right angles to the rest of body ; the 12th is suddenly a little narrower than the 11th ; the cremaster is very stout, flattened above and below, narrowly depressed in ventral line, triangular in shape and of the same width as segment 13 at base. The ventral line of pupa is straight. Head is square in front with two small points, one in front of each eye, the pupa broadening out evenly as far as shoulders, where there is a small projection after which the lateral line along the wings is slightly concave ; the edges of wings (dorsal margins) are very slightly expanded. Surface of pupa is somewhat rough under the lens ; there is a row of very small dorsal tubercles on abdomen, increasing in size backwards and a subdorsal row of larger ones as well as a lateral row like the dorsal one, one tubercle of each row to each segment ;

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there are none on segments 12 and 13 ; on thorax, near hinder margin, there is a subdorsal tubercle. The colour is greyish brown-red with the wings, posterior portion of segment 8 and segment 12 lighter than the rest. The colour is nearly black sometimes with the light parts nearly white. L : 16mm. ; B : 6mm.

*Habits.*—The habits are very much the same as those of *Junonia orithya* in the larval and pupal states as well as for the imago. The latter is found in the same localities as *J. orithya* preferring, perhaps more protection from wind and rain ; it is fond of sitting on paths and open ground with its wings spread to the sun and does not rise far from the ground though it is a quick strong flier. When not basking it rests with its wings closed and is then not easy to see, herein also resembling *J. orithya*. The butterfly is not plentiful in hilly, jungly country, but is common in many parts of the open plains. The larva feeds on *Acanthaceæ* ; it has been bred on *Asteracantha longifolia*, Nees. The butterfly is found throughout Indian limits and extends to China.

**57. Junonia almana**, *Linn.* (Pl. A, fig. 5).—*Dry season form.*—Male and female *upperside* rich orange-yellow. Forewing with a pale dusky and a much darker, sometimes bluish, short, transverse bar with jet-black margins across cell, another somewhat similar bar defining the discocellulars ; costal margin, an inner and an outer subterminal line and a terminal line, dusky black ; a large minutely white-centred bluish ocellus ringed by slender ochraceous line and bordered by black in interspace 2 ; two similar but geminate ocelli with an obscure pale spot above them and a short oblique black or dusky bar connecting them to the black on costa. Hindwing : a small minutely white-centred and very slenderly black-ringed plum-coloured or bluish ocellus in interspace 2, with a large yellow and black-ringed ocellus spreading over interspaces 4, 5, 6, the centre inwardly brownish orange or bluish plum-coloured, outwardly blue and black, with two white spots one below the other between the two colours ; then postdiscal, subterminal and terminal black sinuous lines. *Underside* ochraceous brown, often with a violet bloom, very variable in shade. In most specimens the cell of the forewing is crossed by three dark sinuous bands, the outermost along the discocellulars ; these are very faint in some ; both fore and hindwing crossed by a basal and a discal pale sinuous line margined outwardly by a dark shade which is traversed by an obscure, somewhat obsolescent row of dark spots and outwardly bounded by a subterminal pale sinuous line, the dark shade in many cases spreading on the forewing to the terminal edge of the wing ; on the hindwing the subterminal line meets the discal in an acute angle at the tornus ; the veins are generally slenderly ochreous on the basal half of wings, the cilia also slightly ochreous. Antennæ dark brown ; head, thorax and abdomen more or less orange-brown ; paler beneath.

*Wet season form.*—Male and female *upperside* similar, the black markings deeper in colour and heavier, the subterminal and terminal lines more clearly

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defined, the veins narrowly dusky. *Underside* pale ochraceous. Forewing: cell crossed by five sinuous dark-brown lines, a similar line on the discocellulars and another beyond it, both bent inwards at an angle and continued to the dorsum, the space between them forming a discal broad fascia paling to whitish posteriorly; the post discal ocelli, subterminal and terminal lines as on the upperside but paler. Hindwing: a slender transverse, subbasal, dark line and a discal, whitish, straight fascia in continuation of the one on the forewing; the postdiscal ocelli, the subterminal and terminal lines much as on the upperside but paler; the anterior ocellus with a double iris and centre. Antennæ dark brown; head, thorax and abdomen as in the dry-season form but slightly darker. Exp. 54-62 mm.

These two forms do not only differ very strongly as to the colour of the underside and superficially, in the pattern there, but also in the shape of the wings; the forewing in the *dry-season form* acquiring a very prominent hooked apex; the hindwing a considerable access to the length of the tornal angle or tail; the full *wet-season* insects have neither the hooked apex nor the tail, though of course there are many intermediate ones born at the change of the seasons.

*Larva.*—Shape like the other *Junoniæ*; arrangement of spines also the same. Head broad, heart-shaped, as broad as high; surface shiny, covered with minute white, setiferous tubercles, setæ white; on vertex of each lobe is one larger yellow hair-bearing conical tubercle as also some smaller ones of the same colour; a few black bristles on back margin; colour of head black, apical half of clypeus orange. Spiracles large, oval, shiny black. Surface of body covered with minute white, setiferous tubercles, the setæ black; the surface velvety looking; the segmental membrane are brownish and without tubercles. Segment 2 with a collar of simple erect black hairs, a subspiracular sharp spiniferous pedicel and a smaller one on base of leg. Anal flap ending in a round, shiny black boss. Segments well marked. Segment 12 has the two dorsal spines, a supraspiracular and subspiracular one but none on the ventral face laterally as usual. The colour of the body is smoky black, the neck is orange, the belly brownish, an obsolescent brownish subspiracular line; the spine-bearing pedicels black with dirty light orange spines with black tips to them. L: 41mm.; B: 5·5mm.; L. of pedicels: 2mm.: all of the same length except those on base of legs which are smaller.

*Pupa.*—Is of the usual type. Head square in front, half as long as broad (length in the sense of pupal length), with a small, rather broad, rounded, short point in front of each eye; vertex convex. Segment 2 the same length as head with the front margin bent back in a small sinus towards hinder margin. Thorax broadly and very slightly convex, the slope of dorsal line at front margin being in a plane at right angles to longitudinal axis of pupa, its apex hardly higher than segment 4, its hinder margin a slight curve; it is carinated very slightly in dorsal line. The shoulders are slightly angulated with another small tubercular point at origin of wing. The constriction behind thorax moderate dorsally, wide and shallow laterally; wing expanded, ever so

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slightly between the shoulder-tubercle and the one immediately behind it. Pupa stoutest at segment 7/8 ; section of abdomen circular with the line of junction of wings slightly prominent. Segment 12 suddenly narrower than segment 11 ; segments 12-14 very short ; cremaster stout, short, square, with strong ventral extensor ridges ; hair-hooklets at very extremity. Spiracular expansions of segment 2 represented by little linear orange bodies, hardly prominent ; the spiracles dull black, oval, rather small. Surface finely roughened : velvety looking ; a dorsolateral conical tubercle on segments 3-11, those on segments 4, 6-8 rather large ; a lateral and subspiracular similar, smaller tubercle on segments 6, 7 and 8. Colour dark greyish green with black and cream-coloured markings ; cremaster dark greasy-looking, red-brown ; a broad band on hinder margin of segment 11 interrupted ventrally, two parallel longitudinal ventral bands, a band on posterior margin of segment 8 continued by a broad diagonal light brown band on wing, the posterior side of all dorso-lateral tubercles except those of segments 9 and 10, some markings on segments 1-3, a dorsal blotch on segments 9 and 10, the underside of head : all cream-coloured. L : 20mm. ; B : 7·5mm.

*Habits.*—The egg is laid on the underside of a leaf ; the larva lives there, eating continuously and when full grown may be found anywhere on the plant. The pupa is formed on the underside of a leaf, stalk or stem, or elsewhere, hangs freely and is firmly fixed. The colour of the pupa is liable to little variation, the markings to none. The butterfly is very common, possibly the commonest of the *Junoniæ* in India and sometimes exists in great numbers in certain localities. It is not quite so common in the jungles and hills as in the plains but on the coast in the Konkan, just along the very base of the ghats, it occurs very abundantly in the end of the monsoon, frequenting the neighbourhood of tanks and ponds, the banks of rivers, wet rice fields, &c., where its food-plants or, properly speaking, certain of its food-plants grow in profusion. One of these on which it is commonly found is *Asteracantha longifolia*, Nees., others are *Hygrophila*, *Barleria* of different species, and doubtless there are many others. All of them belong to the family *Acanthaceæ*. The butterfly is a strong flier, but, like the others, never goes very far without settling, basks with its wings open, but rests with them closed and nearly always on the ground, often settling, when put up, after a short flight among leaves and rubbish, after the manner of a *Melanitis*, sideways, showing the whole surface of the underside of wings. This is, no doubt, the reason why the dry season forms have the wonderful leaf-pattern, varying in shade so much on the underside, the produced hooked apices to

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forewing and tail to hindwing which blends so well with withered leaves. It is difficult to imagine any other reason for the complete change that comes over the form and markings of the insect than one having its origin in a desire for protection. The butterfly is found throughout Indian limits; also in China and Japan and in the Malayan subregion.

The pupæ of all the *Junoniæ*, when touched, move the body from side to side with a slightly jerky motion, the bending taking place in segment-margins 8/9, 9/10, 10/11, and each jerk produces a knocking sound destined, there is little doubt, to frighten small enemies, such as flies, spiders, perhaps even lizards and small birds. It is distinctly audible at close quarters.

The genus *Junonia* exists in the tropics of America, in Africa, India and Australia and even further eastwards.

The Plates A, B and C have been published in Vol. XVI of the Journal. No. 4; and Vol. XVII, Nos. 2 and 4. On second thoughts, it has been thought advisable to re-write the descriptions of the butterflies formerly published, notwithstanding what was said in paragraph 5 of the present papers begun in the number issued on the 15th April 1909.

*ERRATA.*

[In the last part of this paper (No. 3, Vol. XIX), the following *errata* occurred] :—

| | | | |
|---|---|---|---|
| Page 636, instead of *Moduza procis* under figure 9. | ... | read ... | *Moduza procris.* |
| Page 636, instead of *Cufa phacida* under figure 10. | ... | read ... | *Cupha placida.* |
| Page 638, instead of *Neptis cunyome* under figure 13 and | ... | read ... | *Neptis eurynome.* |
| instead of *Euthalia lepidea* under figure 14; also, in the | ... | read ... | *Euthalia lepidea.* |
| same line instead of *occillus* | ... | read ... | *ocellus.* |
| Page 639, instead of *Eulapis* in line 14. | ... | read ... | *Eulepis.* |
| Page 640, instead of *lubentine* in line 24; and | ... | read ... | *lubentina.* |
| instead of *Mussoenda* in line 38. | ... | read ... | *Mussænda.* |
| Page 646, instead of *hyperbious* in line 2. | ... | read ... | *hyperbius.* |

Also add to Explanation of Plate facing Pl. II. (Larvæ).

"(All moth larvæ)" under '————' and above 'Fig. 32.'



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# SOME NOTES ON THE GIANT SQUIRRELS OF INDIA, BURMA AND CEYLON.

BY

R. C. WROUGHTON, F.Z.S.

I had occasion recently to lay out, for comparison, all the specimens of this group, in the Collection of the Natural History Museum, S. Kensington, and to look up all the original descriptions of species.

It seems to me that the publication of a few notes of the result of my examination would not only be of interest to members but might induce some of them to obtain and present specimens through this Society, to the National Collection, to help to fill up some of the important gaps in that series.

Blanford, in his 'Mammals,' recognised three species, *viz.*, *Sciurus indicus*, *S. bicolor* and *S. macrurus*. He there merely referred to varieties, which occur in all three of these forms, without exactly differentiating them, but, later, in the Journal of this Society (1897, Vol. XI, p. 300), he accepted 4 forms of the first species mentioned above under the names—(1) *S. indicus* (s.s.); (2.) *S. indicus malabaricus*; (3) *S. indicus bengalensis*; and (4) *S. indicus dealbatus*: the last two names were given by himself on that occasion.

In more recent years these Oriental Giant Squirrels have been separated from *Sciurus*, in a genus by themselves, under the name of *Ratufa*.

The members of this genus seem to be particularly plastic under changes of environment, but at the same time the variation seems to be quite uniform, under the same local conditions. Consequently, we seem to find a form in a comparatively quite small local area differing, slightly it may be, but, nevertheless, definitely and constantly, from all its neighbours of the surrounding area, yet no intermediate stages bridging this difference are forthcoming. The material at my disposal for examination is insufficient to enable me to confidently state this to be the case, but it is undoubtedly shadowed forth by the case of *Ratufa indica*. Between the (practically) self-coloured *indica* of the northern part of the Western Ghats and the much blackened *maxima* of Travancore, etc., we have Blanford's *bengalensis* of the Ganges Valley. But I believe that when we have specimens from a

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sufficient number of localities it will be found that there is a paler and a darker form of what is now typical *indica*, each limited to its own district. And that the Mysore form, intermediate between *bengalensis* and *maxima*, will be found to be constant for its own area and therefore worthy of a name, equally with the other races. This is one of the questions I would ask members to help us to solve.

Blanford recognises as inhabiting Ceylon a grizzled species *S. macrurus* (it should be *macrourus*) and a black variety *S. tennantii* (it should be *tennenti*), but, by some error, he has transposed the names. True *S. macrourus* is the black form and the grizzled one is *tennenti*. It is true that Kelaart states the brown and grizzled forms to be seasonal ones, but I have grave doubts of this; the analogy of changes elsewhere would point to the brown as a seasonal form of the black, if of any, but we have several instances in the genus of just this difference separating definable local races. Here again members can help with dated and exactly localised specimens and notes.

Jerdon and others state that the grizzled form (*R. macrourus tennenti*) is also found on the mainland as far north as Travancore and the Nilgiris. There is a specimen labelled as from the Shevroy Hills in the National Collection, but specimens, exactly localised and dated are badly wanted, not only to prove the existence of this species on the Mainland, but also, that being proved, to show whether it and *maxima* occur together or have separate defined habitats.

The Giant Squirrel of the trans-Gangetic region is recorded by Blanford as *bicolor*, but this is most certainly a misnomer; that name was given to the very distinct form found in Java. The name I have adopted in this paper, viz., *gigantea* was actually based on specimens from Assam. Unfortunately, the National Collection has no specimens from Assam, though it has quite a nice series from Sikhim and Nepaul of the dark-brown western race *macruröides*.

I had hoped at first to deal, in this paper, with the whole genus, but so many forms, which I have never seen, have been named by American naturalists, from Sumatra and the Malay Archipelago, that I had to give up the idea. I have, however, included in these notes the forms of the Malay Peninsula.

Blanford lumps together the large black Assam *gigantea* and the smaller Malay *melanopepla*, two forms which are markedly and constantly distinct in several other characters besides size. The latter, the

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type locality of which is Trong in Lower Siam, is undoubtedly found in Tenasserim (it extends also southwards through the Malay Peninsula and beyond), but how far north it meets *gigantea* or whether there are local races of either in Middle Burma we do not know, for we have no specimens from between the extreme north of Upper Burma, about Bhamo, and the extreme south of Tenasserim.

Further, at Trong, a quite distinct form (*pyrsonota*), closely allied to the *R. affinis* of Singapore, is found together with *melanopepla*. Whether this species extends, changed or unchanged, into Burma, we have no means of judging.

The very 'scrappy' nature of our National Collection of working specimens of Indian Mammals is greatly to be deplored, and I trust means will be found in the early future to remedy it, but in the meantime, I venture to think that it is 'up to' the members of this Society to lend a hand to close up some of these gaps, which I have indicated.

The following is a key to the species and sub-species which in my opinion should be recognised, so far as present material enables us to judge.

Key to the Genus *Ratufa* as represented in India, Burma and Ceylon.

I. Ears tufted (India, Ceylon ? N. Burma).

*A.*—Size smaller (Hindfoot = 75 ;* Skull = 67). Lower portion of legs yellowish white. Feet (or at least toes) black. (Ceylon, S. India).

*a.* General colour black..... (1) *macroura*, Penn.

*b.* General colour dark bay ... (2) *m. ceylonica*, Erxl.

*c.* General colour grizzled ... (3) *m. tennenti*, Blyth.

*B.*—Size larger (Hindfoot = 77—80, Skull = 72—75.)

*a.* Tip of tail and vertex between ears white or pale buff.

$a^1$. General colour yellowish buff (Surat Dangs)..... (4) *dealbata*, Blanf.

$b^1$. General colour hazel or bay.

$a^2$. Tail red ; no black markings.

* Measurements in millimetres.

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on body. (Western Ghats from Kanara to Bombay) ... (5) *indica*, Erxl (s.s.)

$b^2$. Tail black; rump and thighs blackish. (S. Ganges Basin)..... (6) *i. bengalensis*, Blanf.

$c^2$. Tail black; forelegs, shoulders, rump, hindlegs and oftenest a median dorsal line black (Malabar) ..... (7) *i. maxima*, Schreb.

*b*. No white markings on tail or head. Pale colour of inner side of forelimbs never extending over front of forearm.

$a^1$. Colour above black (Assam, N. Burma)..... (8) *gigantea*, McCl. (s.s.)

$b^1$. Colour above dark brown (Nepal, Sikhim) ..... (9) *g. macruroides*, Hodg.

II. Ears not tufted (Tenasserim, Lower Siam, Malay Peninsula, &c.)

*A*.—Shoulders, forelegs and thighs black or at least dark brown. Pale colour of inner side of forelimb spreading over front of forearm—

*a*. Whole upper surface black.

$a^1$. Colour of lower surface paler, 'ochraceous' on belly, fading to yellowish buff on throat and inner side of forelimbs.

$a^2$. Skull wider, zygomatic breadth at least 44 mm.

$a^3$. Size smaller (Hindfoot = 74; Skull = 70) (Lower Siam and Malay Peninsula) ..... (10) *melanopepla*, Mill. (s.s.)

$b^3$. Size larger (Hindfoot = 76; Skull = 72) (Anambas Islands) .. ..... (11) *m. anambæ*, Mill.

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$b^2$. Skull narrower, zygomatic breadth, 41. (Natuna Islands) ... ..... (12) *m. angusticeps*, Mill.

$b^1$. Colour of lower surface darker, at least 'tawny' on belly, fading to 'ochraceous buff', palest on throat and inner side of forelimbs.

$a^2$. Larger (Hindfoot = 75; Skull = 72·5) (Islands of Malacca Straits)..... (13) *m. fretensis*, Thos. and Wrough.

$b^2$. Smaller (Hindfoot = 72; Skull = 68·4) (Tioman Island) ..... (14) *m. tiomanensis*, Mill.

*b*. Shoulders, forelegs and thighs darker than rest of body.

$a^1$. Pale patch on vertex between the ears; tail pale yellow (Java), (15) *bicolor*, Sparrm.

$b^1$. No pale patch on vertex; tail dark (Sumatra &c.)

$a^2$. Size larger (Hindfoot = 78; Skull = 68) (Sumatra)...(16) *palliata*, Mill. (s.s.)

$b^2$. Size smaller (Hindfoot = 70; Skull = 68) (Banjak Islands, West Coast of Sumatra) ..... (17) *p. lœnata*, Mill.

*B*.—Shoulders, loins and legs not darker than rest of body; pale colour of inner side of forelimbs not extending over front side of forearms.

*a*. Colour of belly white (Singapore; Johor) ..... (18) *affinis*, Raffles. (s.s.)

*b*. Colour of belly yellow.

$a^1$. Feet yellow (Malacca) ..... (19) ? *a. auriventer*, Is. Geoff.

$b^1$. Feet dark (Selangore; northwards to Lower Siam..... (20) *a. pyrsonota*, Mill.

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1. *Ratufa macroura*, Penn.

1769. *Sciurus macrourus*, Pennant. Ind. Zool. I., pl. 1.

1785. *Sciurus ceilonensis*, Boddaert. Elench. An. p. 117.

*Colour.*—Above uniform black, below 'ochraceous buff.' Head ochraceous buff except for the forehead, above the level of the eyes, and a mark, shaped like an inverted '**V**' on the cheek, between eye and ear, black. A pale patch on the vertex between the ears. Forearms and hindlegs, below the upper thigh, buff. Hands and feet black. Tail black.

*Skull.*—Small. Nasals showing a slight expansion posteriorly in the skull I have seen.

*Dimensions*—Head and body, 300; tail, 340; hindfoot, 75. *Skull.*—Greatest length, 67; basilar length, 50; zygomatic breadth, 40; nasals, 20; diastema, 14·4; braincase breadth, 28·3; inter-orbital breadth, 25·5; upper molar series, 13·2.

*Synonymy.*—There has been much confusion in the naming of this species. Pennant, however, gave a figure of his *S. macrourus* which admits of no doubt. It is a uniformly black animal with a yellow belly and yellow fore and hindlegs, with black feet.—Boddaert's *ceilonensis* was confessedly a renaming of *macrourus*.

All naturalists since then seem to have ignored this black form altogether, and given the name *macrourus* to one of the other forms and even to the continental *R. indica maxima*. Blanford has, in his 'Mammalia,' actually transposed the names *macroura* and *tennenti*.

*Distribution.*—Owing to this difficulty of exactly appreciating of which particular form any given naturalist is treating, I have found it impossible to localise the habitat of this form. Blanford declares it to be a hill form, but I think this will prove to be a mistake and typical *R. macroura* will be found to inhabit low-lying forests. Any information which members can record on this point will be valuable.

2. *Ratufa macroura ceylonica*, Erxl.

1777. *Sciurus vulgaris ceylonicus*, Erxleben. Syst. Regn. An. p. 416.

*Colour.*—Pattern exactly as in true *macroura*, but a dark 'bay' everywhere substituted for the black in that form. Tail often with white tipped hairs especially in distal $\frac{2}{3}$.

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*Skull.*—As in true *macroura*.

*Dimensions.*—Probably as in true *macroura*, judging from the specimens.

*Distribution.*—This form is represented in the National Collection by two specimens received with the East India Company's Collection. As already pointed out by Anderson (Zool. West. Yunnan p. 227); these specimens though labelled Java are quite different from anything known to occur in that island; and I may add are certainly indicated as coming from Ceylon by their yellow lower limbs, a character found nowhere else. In what part of Ceylon this race is found I cannot say nor even whether it extends to the mainland; this last I should very much doubt. This form is stated to be a seasonal form by Kelaart and others, but basing on the analogy of similar differences in other species I prefer to accept it provisionally as being a local race until more definite proof to the contrary is forthcoming.

3. *Ratufa macroura tennenti*, Blyth.

1849. *Sciurus tennentii.* Blyth, J. A. S. B. B., XVIII., p. 600.

*Colour.*—Pattern as in true *macroura* and *ceylonica*, but the 'bay' of the latter so profusely grizzled with white (each hair being tipped with white) as to be detected only by close examination. Buff of the fore arms and hindlegs extending more on to the feet than in either of the other two forms, so that only the toes remain black. Tail strongly grizzled with white from its very base, in its distal half obscurely, transversely barred black (or dark brown) and white, the bars each about 6-7 mm. wide.

*Skull.*—Slightly larger and stouter than in the other races.

*Dimensions.*—External dimensions possibly slightly larger than in *macroura*, though the hindfoot measurement does not materially differ from that of the other races.

*Synonymy.*—The name as spelt by Blanford (tennantü) is not authorized. The name as first published by Blyth was *"teanentii."* This was obviously a misprint and 2 years later Blyth himself mentioned it again as *tennentii.*

*Distribution.*—This is, I think, undoubtedly the high level form (Kandy or higher). Jerdon quotes with some doubt instances of a pale form or faded specimens of this race having been taken in Mysore and on the Nilgiris and claims himself to have received it from Malabar.

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There is a flat skin in the National Collection collected by Mr. W. M. Daly in the Shevroy Hills. It seems possible, therefore, that it occurs in the Peninsula, but whether it is found on the same ground as *R. maxima* or not remains to be shown.

4. *Ratufa dealbata*, Blanf.

1897. *Sciurus indicus dealbatus*, Blanford, Journ. B.N.H.S., XI., p. 301.

*Colour.*—General colour of the back 'cream buff' darkening to 'ochraceous buff' posteriorly, the individual hairs 'drab' for half their length basally, narrow paler line along middle of back; of under surface a buffy white. Ears clothed with long tawny ochraceous hairs forming a tuft. Face, forearms, hands and feet buffy white. Proximal ¼ of tail coloured like lower back, but the distal pale portions of hairs being proportionately shorter, looking darker, remainder of tail white, individual hairs white to their bases.

*Skull.*—Short and broad, as compared with *indica*; Nasals scarcely narrowed posteriorly.

*Dimensions.*—Head and body, 370; tail, 417; hindfoot, 77; skull: greatest length, 72: basilar length, 55; zygomatic breadth, 47; nasals, 24·5; diastema, 15; braincase breadth, 31; interorbital breadth, 30·5; upper molar series, 14·8.

*Synonymy.*—Blanford described this animal doubtfully as a subspecies of *indica*, to which it is undoubtedly very closely allied. In view of its totally different colour and the difference in the shape of the nasals, a character which appears to be constant in the other races of *indica*, I have ranked this as a distinct species.

*Distribution.*—I first found this animal in the Forests at the North extremity of the Surat Dangs. Its range was apparently very limited, extending over little more than 100 square miles. A friend, who has later visited the locality, tells me the race is now extinct, the last individual having been killed and eaten in the famine of 1900.

5. *Ratufa indica*, Erxl.

1777. *Sciurus indicus*, Erxleben, Syst. Regn. An. p. 420.

1777. *Sciurus purpureus*, Zimmermann, Spec. Zool. Geog. Quad. p. 518.

1785. *Sciurus bombayanus*, Boddaert, Elench. An. p. 117.

1831. *Sciurus elphinstonii*, Sykes, P. Z. S. p. 103.



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*Colour.*—General colour of upper side bright 'hazel,' basal half of individual hairs drab, a narrow paler line along middle of back, obsolescent but recognizable; of the under surface 'cream buff'. Face brownish white, approaching 'clay colour', a white patch on crown, between the ears. Ears covered with long hairs rather darker than the back, forming a tuft. Tail basally coloured like back, fading through ochraceous white to pure white, in last third of its length. Hands and feet coloured like face, forearms rather paler.

In a common variety 'bay' takes the place of 'hazel' in the general colour and the pale colouring on the tail is usually limited to an orange-white tag at the extreme point.

*Skull.*—Large and stout.—The nasals narrowing posteriorly for $\frac{2}{3}$ their length and then widening again.

*Dimensions.*—Head and body, 400; tail, 425; hindfoot, 78. The first two measurements are those given by Erxleben and are probably fairly correct. Skull: greatest length, 71; basilar length, 56; zygomatic breadth, 4·45; nasals, 2·23; diastema, 15·6; braincase breadth, 32; interorbital breadth, 28; upper molar series, 14·5.

*Synonymy.*—Erxleben's preface to his Syst. Regn. An. is dated 1776. So as a choice has to be made between his and Zimmermann's names, I have followed Blanford in adopting *indica* as the older. Both authors, as well as Boddaert, quote Pennant's 'Bombay Squirrel'. Sykes based his *elphinstonii* on three specimens now in the national collection, two of which were the 'hazel' and one the 'bay' variety.

*Distribution.*—This race is found throughout the Ghats in the Bombay Presidency. I have seen the 'hazel' variety often North of Poona, but never the 'bay'. It is possible that more material will show that the two varieties do not occur together, but are as well marked geographical races as any of the others, in which case the name of *elphinstonii* will be available, for the 'hazel' form by limitation, all the other names having undoubtedly been based on the 'bay' animal.

### 6. *Ratufa indica bengalensis*, Blanf.

1897. *Sciurus indicus bengalensis*, Blanford, Jour. B. N. H. S., XI., p. 303.

*Colour.*—General colour as in the dark variety of true *indica*, but

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the tail, instead of being concolorous with the back, is black throughout, except for a pale tip.

*Skull.*—Quite as in true *indica.*

*Dimensions.*—As in true *indica.*

*Distribution.*—*Ratufa indica* seems to be peculiarly sensitive to the action of environment. Almost each Forest seems to harbour its own variety, but, in any locality, the prevailing variety seems to be extraordinarily constant in its characters. Blanford gives as the distribution of the present race "Western Bengal, Orissa, Chutia Nagpur, and the Northern Circars, * * * , Jaipur and the neighbourhood of the Godaveri." A couple of specimens sent by Mr. Caccia, I. F. S., from Hoshangabad certainly are more like Mysore specimens than *bengalensis.* I would venture to prophesy that when sufficient material is available the habitat of *bengalensis* will be found to coincide closely with the South side of the Ganges Basin; that a new name will have to be found for the race inhabiting the central portion of India.

7. *Ratufa indica maxima*, Schreb.

1784. *Sciurus maximus*, Schreber. Saugth. IV. p. 784, pl. ccxvii, B.

1786. *Sciurus malabaricus*, Scopoli, Del. Faun. Flor. Ins. II., p. 85.

*Colour.*—Colour (including that of tail) as in *bengalensis*, but the shoulders, rump and thighs, black (in some specimens); the black of the shoulders and rump joined by a medial black line, so that, in extreme cases, only the flanks remain 'bay').

*Skull.*—As in *indica*, in all essential characters, slightly larger in size.

*Dimensions.*—Rather larger than *indica.* Hindfoot, 80. Skull: greatest length, 77; basilar length, 60; zygomatic breadth, 49; nasals, 24; diastema, 16.5; braincase breadth, 33; interorbital breadth, 30; upper molar series, 15.

*Synonymy.*—Blanford adopts (B. N. H. S. Jour. 1897, p. 302), the later name *malabarica* which of course is inadmissible.

*Distribution.*—The main habitat of this race is the Malabar Coast. How far it extends southwards towards Cape Comorin remains to be decided. It is stated that in the extreme south of the Peninsula the giant squirrels are represented by *R. macroura tennentii*, but

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whether any race of *indica* is also present is not known. For the present, Mysore must be included within the range of *malabarica*, but the form found there seems to differ quite as much from typical *malabarica* as it does from typical *bengalensis*. When more material is available, it will probably (joined with the form of the Godavery Valley), be separated as a quite constant geographical race.

### 8. *Ratufa gigantea*, McCl.

1839. *Sciurus giganteus*, McClelland (Horsfield), P. Z. S. p. 150.

*Colour.*—Above, entirely black, individual hairs paling to 'burnt umber' at their bases; below, buff, individual hairs of the abdomen however, black for their basal halves, giving a soiled appearance to this part. Face coloured like back, cheeks, upwards to a line drawn from the ear to the nose through the eye like the belly, except for a dark horizontal streak below the eye. Two small black spots below the chin.

*Skull.*—Longer than in *macruroides*.

*Dimensions.*—Head and body, 417; tail, 477; hindfoot, 87. Skull: greatest length, 80; basilar length, 62; zygomatic breadth, 49; nasals, 26; diastema, 17.6; braincase breadth, 35.5; interorbital breadth, 31; upper molar series, 15.

*Distribution.*—The species was described "from seven or eight specimens" taken in Assam. The Natural History Museum has no specimen from that locality, but 2 skins from the N. Burma frontier and one from N. Siam show no variation and accord well with McClelland's description.

### 9. *Ratufa macruroides*, Hodgs.

1849. *Sciurus macruroides*, Hodgson, J. A. S. B. XVIII., p. 775.

*Colour.*—General pattern exactly as in *gigantea*. Above, burnt umber; below 'ochraceous buff.' Hands, feet and tail rather darker than back.

*Skull.*—Rather smaller than in *gigantea*.

*Dimensions.*—As in *gigantea* proportionately shorter, about equal in length to head and body. Skull: greatest length 77; basilar length, 61; zygomatic breadth, 47.5; nasals, 24; diastema, 17; braincase breadth, 34; interorbital breadth, 33; upper molar series, 14·8.

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*Synonymy.*—The name *macruroides* was published first by Hodgson in 1844 (Calc. Journ. N. H. IV, p. 293), and thereafter two or three times, without any description. In 1849, however, in a paper on the Geography, &c., of Nepaul, he mentioned it in connection with what may be technically accepted as a description. That the present animal is the one referred to by Hodgson is proved by the series of specimens in the National Collection presented by him. No other *Ratufa* is known from Nepal.

*Distribution.*—Besides Hodgson's Nepal specimens there is a specimen in the collection from Sikhim. From Assam eastwards it is replaced by *gigantea*.

10. *Ratufa melanopepla*, Mill.

1900. *Ratufa melanopepla*, Miller, Prac. Wash. Ac. Sc. II. p. 71.

*Colour.*—Above, glossy black, basal half of individual hairs dark reddish brown; below 'ochraceous', bases of hairs blackish brown. Face black; cheeks pale yellow ('cream buff'), a black horizontal streak behind whiskers and a black spot under the chin. Inner sides of arms and legs buff, this pale colour spreading over outer side of forearm. Hands, feet and tail black.

*Skull.*—As in *gigantea* but smaller; bullœ narrower.

*Dimensions.*—Head and body, 360; tail, 430; hindfoot, 75. Skull: greatest length, 70; basilar length, 53; zygomatic breadth, 44; nasals, 22; diastema, 15; braincase breadth, 31; interorbital breadth, 28·5; upper molar series, 14.

*Distribution.*—The type locality is Trong, Lower Siam. The Museum Collection contains specimens from Camboja, Lower Siam, Tenasserim, Selanga Island and the Malay Peninsula as far south as Selangore.

11. *Ratufa melanopepla anambæ*, Mill.

1900. *Ratufa anambæ*, Miller, Proc. Wash. Ac. Sc. II., p. 215.

I have seen no individual of this species and extract the following details from Miller's original description. It is characterised especially by its large size.

*Colour.*—"Cheeks, throat, sides of neck, inner surface of legs and entire ventral surface of body rich tawny yellow (ochraceous), paler on throat, cheeks and sides of neck, richer on chest, the belly much

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darkened by appearance at surface of blackish bases of hairs. Remainder of pelage and entire tail glossy blue black, with the usual reddish brown cast below the surface."

*Skull.*—As in *melanopepla*. "bullæ narrower and more elevated above surface of basi-occipital."

*Dimensions.*—Head and body 374; tail 451; hindfoot 76. Skull: greatest length, 72; basilar length, 56; zygomatic breadth, 45; nasals, 25; interorbital breadth, 26; upper molar series, 14.

*Synonymy.*—As an island form Mr. Miller ranked this as a distinct species, but in my opinion it is in every way more convenient to treat it as a geographical race of the very similar *melanopepla*.

*Distribution.*—Anambas Islands, South China Sea.

12. *Ratufa melanopepla angusticeps*, Mill.

1901. *Ratufa angusticeps*, Miller. Proc. Wash. Ac. Sc. III, p. 130.

The type specimen, the only one known, is in the Washington Museum. I borrow the following details from Miller's original description.

*Colour.*—"Precisely like that of *Ratufa anambæ* and *R. melanopepla*."

*Skull.*—"Immediately recognisable by its general narrowness, but particularly in the region of the anterior zygomatic roots. Audital bullæ narrower and more elongate than in *R. melanopepla* and more elevated above the basi-occipital. Lateral processes of basi-occipital obsolete."

*Dimensions.*—Head and body, 342; tail, 406; hindfoot, 74. Skull: greatest length, 68·6; basilar length, 52; zygomatic breadth, 41; nasals, 22; diastema, 15·6; interorbital breadth, 27; upper molar series, 14.

*Synonymy.*—I prefer to treat this form as a sub-species of *melanopepla*.

*Distribution.*—Lingung Island, Natuna Archipelago. The only individual yet found so far South.

13. *Ratufa melanopepla fretensis*, Thos. & Wrough.

1909. *Ratufa melanopepla fretensis*, Thomas and Wroughton, A. M. N. H. p. 535.

*Colour.*—As in *melanopepla*, but the pale portions markedly darker

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than in that form. The abdomen and chest are 'tawny' or even darker and fade at most to 'ochraceous buff' on the cheeks and forelimb.

*Skull.*—As in *melanopepla*.

*Dimensions.*—Head and body, 370 ; tail, 430 ; hindfoot, 76. Skull: greatest length 72·5 ; basilar length, 55 ; zygomatic breadth, 46 ; nasals, 22 ; diastema, 16·4 ; braincase breadth, 32 ; interorbital breadth, 27 ; upper molar series, 13·1.

*Distribution.*—The type locality is Lungkawi Island, but it is also found in Terutau and Penang Islands in the Straits of Malacca.

14. *Ratufa melanopepla tiomanensis*, Mill.

1900. *Ratufa tiomanensis*, Miller, Proc. Wash. Ac. Sc., II., p. 216.

*Colour.*—As in *fratensis*, but even darker.

*Skull.*—As in *melanopepla*.

*Dimensions.*—Head and body, 350 ; tail, 380 ; hindfoot 72.

*Distribution.*—Tioman Island on the East Coast of the Malay Peninsula.

15. *Ratufa bicolor*, Sparrm.

1778. *Sciurus bicolor*, Sparrman, Gotheb. Vet. Svensk. Handl. I., p. 70.

1780. *Sciurus javensis*, Zimmermann, Geog. Gesch. II., p. 342.

1817. *Sciurus albiceps*, Desmarest, Nouv. Dict. H. N. X., p. 105.

1820. *Sciurus leschenaultii*, Desmarest, Mamm., p. 335.

1835. *Sciurus humeralis*, Coulon, Mem. Soc. S. N. Neufch. I., p. 122.

*Colour.*—General colour of back very dark 'bay' (almost black), bases of individual hairs black, paling to brown at tip of belly, chest and throat and inside of thighs, and front of forearm, 'ochraceous buff', individual hairs with basal $\frac{2}{3}$ black. Face coloured like back but paling markedly above the level of the eyes ; cheeks dull white. Dark spot under the chin. Sides of neck and inside of forelegs bright 'buff', the hairs unicoloured to their bases. Shoulders and outside of upper arms black. Loins, thighs and basal portion of tail (100 mm.) black, but the hairs coarsely tipped with white (grizzling usually less, often absent, immediately at the base of the tail). Feet

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and hands black, some grizzling on the former. Tail (beyond the basal dark portion) bright 'buff'.

*Skull.*—As in *melanopepla*, but slightly larger.

*Dimensions.*—Head and body, 360; tail, 400; hindfoot, 75. Skull: greatest length, 72; basilar length, 56; zygomatic breadth, 45; nasals, 21; diastema, 17; braincase breadth, 31; interorbital breadth, 28; upper molar series, 14.

*Synonymy.*—The names *bicolor*, and *javensis* refer undoubtedly to typical *bicolor*. Desmarest no doubt had before him in 1817 an abnormal individual with the normal paling of colour on the forehead and vertex carried to extremes (such examples are probably not rare; there is in the Museum Collection a Siamese specimen of *melanopepla* which has an almost white head, although normally in that species no paling of colour on the crown is to be found). To some such specimen he gave the name *albiceps*. Two years later however, having received normal specimens of *bicolor*, he described and named *leschenaultii* from them. *Sciurus humeralis* of Coulon, as shown by both description and figure, is typical *bicolor*.

*Distribution.*—Island of Java.

### 16. *Ratufa palliata*, Mill.

1902. *Ratufa palliata*, Miller, Proc. Ac. N. S. Phil., p. 147.

*Colour.*—General pattern as in *bicolor*, but pale area on vertex, grizzling on loins and thighs absent, yellow on tail obsolescent. Colour of back near 'russet' when fresh, rapidly fading: lower surface dirty yellowish, individual hairs brown with yellow tips. Face, neck, arms and thighs dark brown, almost black. Cheeks, sides of neck and inside of forelegs pale yellow. Throat and inner side of hindlegs like belly, usual dark spots under chin. Tail coloured like back but the hairs tipped whitish (showing when tail is flattened a pale edging along its whole length.)

*Skull.*—As in *bicolor*, but anterior portion shorter; teeth rather smaller.

*Dimensions.*—Head and body 345; tail 425; hindfoot 78. Skull: greatest length, 68; basilar length, 53; zygomatic breadth, 42 nasals, 21; diastema, 16; braincase breadth, 33; interorbital breadth, 29; upper molar series, 12·8.

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*Distribution.*—Type locality Indragiri River. It seems to range along the whole East Coast of Sumatra.

17. *Ratufa palliata lœnata*, Mill.

1903. *Ratufa lœnata*, Miller, Proc. U. S. Nat. Mus. XXVI., p. 720.

*Colour.*—Quite as in *palliata*, but the white tips of the hairs of the tail rather longer, and therefore the white lateral edges of the spread out tail more marked.

*Skull.*—Skull in size and form as in *palliata* : the premaxillaries extending farther behind posterior edge of nasals, palate narrower relatively to its length than in typical *palliata*.

*Dimensions.*—Head and body, 330 ; tail, 400 ; hindfoot 68. Skull ; greatest length, 68 ; basilar length, 52 ; zygomatic breadth, 41 ; nasals, 22 ; interorbital breadth, 27 ; upper molar series, 13.

*Synonymy.*—As an island form Miller ranks it as a species.

*Distribution.*—Banjak and Batu Islands, West Coast of Sumatra.

18. *Ratufa affinis*, Raff.

1822. *Sciurus affinis*, Raffles, Trans. Linn Soc. XIII., p. 259.

*Colour.*—General colour above drab, individual hairs very shortly tipped black, giving a minutely grizzled effect in certain lights, dorsal colour becoming more and more ochraceous towards the flanks, till a stripe about 15 mm. broad is pure 'tawny ochraceous'. Colour of lower surface pure white. Tawny ochraceous of flanks extending on to the forearms and hind legs. White of belly extending upward on the thighs. Tail coloured like the back above, white (medially at least) below. Hands and feet white.

*Skull.*—Skull small, but in form normal ; nasals contracting posteriorly to about two-thirds their length, then expanding to posterior margin. In this character resembling *indica*, etc., and differing from *melanopepla*, etc.

*Dimensions.*—Head and body, 330; tail, 380 ; hindfoot, 70. Skull ; greatest length, 67 ; basilar length, 51 ; zygomatic breadth, 40 ; nasals, 21 ; diastema, 15 ; braincase breadth, 31 ; interorbital breadth, 27 ; upper molar series, 13·5.

*Habitat.*—Singapore Island, extending northwards on main land to Johor.



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19. *Ratufa affinis auriventer*, Is. Geoff.

1831. *Sciurus auriventer*, Is. Geoffroi, Voy. Bel. Indes, p. 151.

*Colour.*—General colour above as in *affinis*; below tawny ochraceous of flanks, extending downwards and replacing white of *affinis*. Thigh patch buffy white. Tail coloured above like the back; below, at least medially, white. Hands and feet coloured like the belly.

*Skull.*—As in *affinis*.

*Dimensions*—As in *affinis*.

*Synonymy.*—The name *auriventer* was based on a specimen said to have been brought from Java by M. Diard, who also collected in the Peninsula. In other cases it has been found that there has been confusion in assigning the true locality to specimens collected by him. Nothing resembling the description of *auriventer* has been found in Java, while on the other hand it very well fits the present form, and I follow Bonhote (A. M. N. H. 1900, p. 495), therefore in accepting the name for this form.

*Habitat.*—All the specimens in the National Collection are labelled "Malacca," and, as the next form is found in Selangore and thence northwards as far as Trong in Lower Siam, this must mean the Island of Malacca.

20. *Ratufa affinis pyrsonota*, Mill.

1900. *Ratufa pyrsonota*, Miller, Proc. Wash. Ac. Sc. II., p. 75.

*Colour.*—General colour above grizzled ochraceous, individual hairs slate grey at base; below clear ochraceous. This is in fact a very ochraceous coloured form of *affinis*, with very dark brown feet.

*Skull.*—As in *affinis*, but larger.

*Dimensions.*—Head and body, 350; tail, 400; hindfoot 75. Skull: greatest length, 65; basilar length, 51; zygomatic breadth, 41; nasals, 21; diastema, 16; braincase breadth, 32; interorbital breadth, 26; upper molar series, 13.

*Distribution.*—The type locality is Trong in Lower Siam, but it extends as far South as Selangore.

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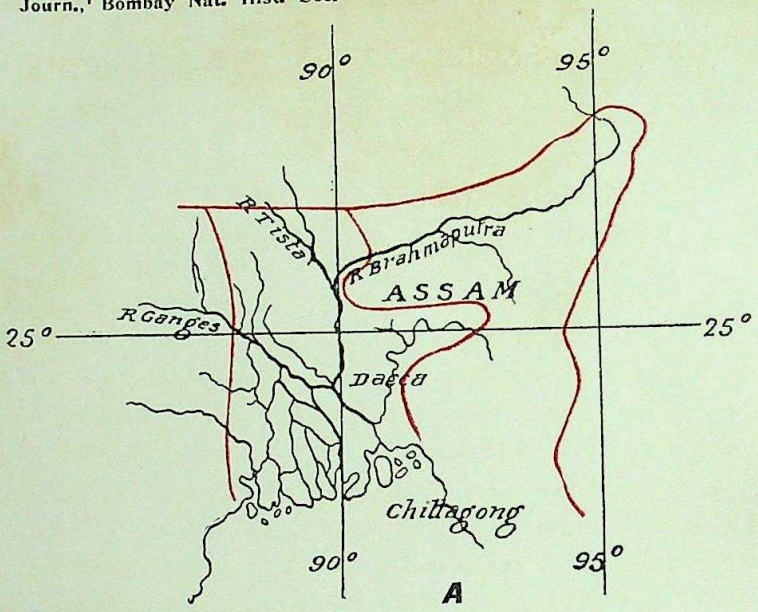
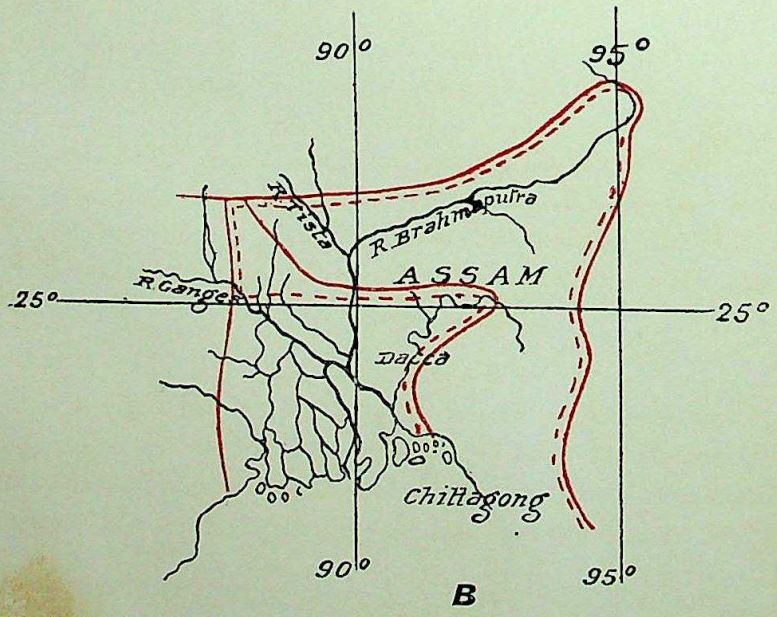



(A) Boundaries of the Bengal and Assam Tracts as shown by Blanford (Phil. Trans., Royal Soc., Lond., Series B, Vol. 194, 1901).




(B) Modification of the boundary between the Bengal and Assam Tracts as suggested by this paper.

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# NOTES ON SNAKES COLLECTED IN THE JALPAIGURI DISTRICT.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

(*With a Map.*)

Last year I received a collection of snakes from Mr. W. A. Jacob, I.F.S., made by himself in the Jalpaiguri District.

With two exceptions, *viz.*, one *Dipsadomorphus cynodon*, which was caught west of the Tista River, and the *Naia bungarus*, which was killed in the Buxa Division (2,000 ft. elevation), about 100 miles east of the Tista, all were collected between 10 to 50 miles east of the Tista, at altitudes varying from about 500 to 1,200 feet.

From this collection it would appear that the boundary between the Bengal and Assam Tracts, north of the 25th parallel is placed too far to the east by Blanford (see figure A). There can be little doubt that this boundary should be the Tista River or still further west (see figure B). It even seems probable that all the territory lying above the 25th parallel east of Purneah should be included in the Assam Tract (see interrupted red line in figure B). In support of this are the following records. From the east *Typhlops diardi* and *Simotes cyclurus* have been found as far west as Purneah. *Simotes albocinctus* as far west as Kaliganj.

Of Indian snakes *Polyodontophis sagittarius* is recorded as far east as Darbangha, *Simotes arnensis* to Kaliganj, *Zamenis fasciolatus* to Monghyr, *Dipsadomorphus forsteni* and *Bungarus cæruleus* to Purneah. All of these records are based on specimens in the Indian Museum.

## TYPHLOPIDÆ.

### *Typhlops diardi.*

One adult specimen. The scale rows are 26 anteriorly and in midbody, and 24 at a point two headslengths before the anus. The reduction of rows is singular and due to a fusion of the 2nd and 3rd rows and the 5th and 6th rows both on the right side of the median ventral.

## COLUBRIDÆ.

### *Tropidonotus stolatus.*

Seven examples.

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*Tropidonotus piscator.*

One specimen of variety *quincunciatus.*

*Pseudoxenodon macrops.*

A single specimen.

*Lycodon aulicus.*

One specimen of variety D of Boulenger's Catalogue. The ventrals and subcaudals 211 + 67. Anal divided.

*Coluber cantoris.*

A single example. The costals are in 21 rows, two headslengths behind the head and in midbody, 17 at a point two headslengths before the anus. Ventrals and subcaudals 229 + 69. The 3rd supralabial is not divided, and the 4th and 5th only touch the eye.

*Dendrophis proarchos** (Wall).

2 examples. The costals are in 15 rows anteriorly and in midbody, 9 at a point two headslengths before the anus. The ventrals and subcaudals 182+142 and 192+ ?, the latter a ♀. The anal is entire in both specimens and both entirely agree with the many Assam specimens I have seen of this snake. The vertebral are broader than long. The supralabials are 9, the 4th, 5th and 6th touching the eye. The ♀ contained 7 eggs but the date of capture is unfortunately not on record.

*Simotes albocinctus.*

One variety *typica* (Cantor), and two of a variety calling for special remark. It is most like *juglandifer* (Wall) (variety C of Boulenger's Catalogue), but differs in that there are no black walnut-shaped spots. A darker broad stripe 5 rows wide, runs down the middle of the back, and a narrower dark stripe between the 3rd and 4th rows above the ventrals and there are no crossbars. I suggest the name *dorsolateralis* for it. It is probably only a modified form of *juglandifer* for a suggestion of the walnut marks is sometimes noticeable here and there if looked for beneath a lens. The costals are in 19 rows, anteriorly and in midbody, and 15 at a point two headslengths before the anus. The ventrals and subcaudals are var. *typica* 191+?, and in the others 170+30, and 162+39. The supralabials in variety *typica* are 8, the 4th and 5th touching the

* A description of this snake appears in a paper on the Snakes of Assam in this Number, page 827.

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eye on the right side, normal on the left. In both specimens of variety *dorsolateralis* the 3rd supralabial is divided into an upper and a lower part. (Hence the subocular of Boulenger). In one of these the lower fragment is not completely excluded from contact with the eye.

*Dryophis prasinus.*

Two examples. The costals are in 15 rows anteriorly, and in midbody and in the ♂ come to 11 at a point two headslengths before the anus. In the ♀ they reduce to 9 at the same site. The ventrals and subcaudals of the ♂ are 198+157? and of the ♀ 201+159. There are two loreals in the ♂ 1+1, three in the ♀ 1+1+1. In the ♂ the 4th supralabial is not divided, but in the ♀ it is so, that the upper part only touches the eye.

*Chrysopelea ornata.*

One brilliantly coloured example of variety E of Boulenger's Catalogue (III, p. 198). The costals are in 17 rows anteriorly and midbody, and 13 at a point two headslengths before the anus. The ventrals and subcaudals are 215×112+? (tail slightly docked). The last ventral as well as the anal is divided.

*Dipsadomorphus cynodon.*

Two fine examples of variety A of Boulenger's Catalogue (III., p. 79.). The costals are in 23 rows anteriorly, and in midbody, 15 at a point two headslengths before the anus. The ventrals and subcaudals are 255+ 126 and 256 + 123. One of these specimens was being attacked by a banded krait (*Bungarus fasciatus*) which Mr. Jacob shot.

*Bungarus lividus.*

One small example. The vertebrals are very slightly enlarged. The ventrals and subcaudals are 212+39.

*Naia bungarus.*

One young specimen, about 6 feet in length. The costals are 17 at a point two headslengths behind the head, 15 in midbody and 15 at a point two headslengths before the anus. The ventrals and subcaudals are 251+80, of the latter the first to the fifth are entire, the rest divided. It is black with narrow buff bands posteriorly. Mr. Jacob tells me that a pair of hamadryads were reported to

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have been killed "in copula" on a tea garden close to him at the end of April or early in May last year.

VIPERIDÆ.

*Lachesis gramineus.*

A single specimen. The costal rows are 21 in the anterior and middle parts of the body, 15 at a point two headslengths before the anus. The ventrals and subcaudals 171+57. It is greenish-yellow in colour with a whitish flank line. It had evidently eaten some mammal for a mass of felt-like matted hair was protruding from the anus.

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# NOTES ON THE BIRDS OF CHITRAL.

(*October* 1902 *to October* 1903.)

BY

CAPT. G. A. PERREAU, F.Z.S. (4TH GURKHAS).

It is not necessary for me to go into details about the country, as Capt. H. Fulton has already done that in his notes, see Vol. XVI, p. 44, of this Journal. My area was small, being practically only the ground about Drosh, the main valley between Nagar and Chitral, and the valley between Nagar and Ziarat. I certainly had one productive but rapid trip up the Mastuj Valley, nearly as far as the Shandur Lake, but most of my birds were got at under 7,000 ft. I commenced operations soon after arrival, earlier, I fancy, than Capt. Fulton did; but, on the other hand circumstances prevented me from doing as much as I should have liked after August. My best thanks are due to Capt. Fulton for allowing me to copy his rough notes before he left Chitral; they were most useful.

I follow the numbers and nomenclature in "The Fauna of British India—Birds". Except where otherwise mentioned identification was made from skins. Those which come under Vol. II, (with a few at the end of Vol. I, put in to fill up a box), slightly under two hundred, were sent to the Society. The remainder were retained by me for the purpose of substituting proper labels for my rough ones, which were of no use without my notes. These skins (over 250) were destroyed by mice, a warning to send off things quickly. However the only doubtful ones were amongst the lot sent. My best thanks are due to Mr. E. Comber for checking them at the British Museum (Natural History), and to Mr. N. B. Kinnear for kindly clearing up some doubtful points by looking up specimens in the Society's collection.

I am sure Capt. Fulton will not mind my quoting his records in cases where I have not observed the bird myself. It makes it much easier for future observers to have all records together. In spite of Mr. Comber's opinion, I think that the list from Chitral is still very incomplete. See also Vol. XVI., p. 744 and Vol. XVIII., p. 186 for additions to Capt. Fulton's above-mentioned notes. Species marked

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with an asterisk are not recorded by Capt. Fulton, who recorded none of which he did not make a skin.

FAMILY—CORVIDÆ.

(4) *Corvus macrorhynchus*—(THE JUNGLE CROW.)

Common all the year round near Drosh. There was a pied one generally about the Fort ; some breed close, some appear to go higher.

* (5) *Corvus frugilegus.*—(THE ROOK.)

Arrived in flocks on Lower Drosh farm about mid-March and went off at the end of April.

(9) *Corvus monedula*—(THE JACKDAW.)

Small parties arrived and departed with the rooks. I have no doubt that more careful observation (or perhaps more shooting) would add to the list of "crows."

(10) *Pica rustica*—(THE MAGPIE.)

Fairly common in December as low down in the main valley as Ghaira under 4,500 feet. Saw numbers courting in the Mastuj valley in May.

(24) *Garrulus lanceolatus*—(THE BLACK-THROATED JAY.)

Very common all the year round; down to 4,000 feet in winter. Chitralis often hawk it with a sparrow-hawk, with little success as a rule ; it is hard to drive out of cover.

(28) *Nucifraga multipunctata*– (THE LARGER SPOTTED NUT-CRACKER.)

No skin obtained; one was sent in to me from Utzen about 7,500 feet, the condition allowed easy identification, but the skin was a bad failure. I saw two in June in the Drosh nullah at about the same height. Fulton records it from Pattison.

* (29) *Graculus eremita*—(THE RED-BILLED CHOUGH.)

Common along the main valley at about 5,000 feet from November till March. I saw them at no other time.

(30) *Pyrrhocorax alpinus*—(THE YELLOW-BILLED CHOUGH.)

Like the last but coming down lower and staying later. Villagers at Ayon offered to take me to a nesting place, stating that it was a good way off and up, and that the nests were nearly inaccessible. Nearly inaccessible for a Chitrali means a great deal and anyhow I could not go just then. One of my skins had black legs with yellow not red, showing through the joints, not sexed.

SUBFAMILY—PARINÆ.

The Tits are very fairly represented, but I think the list can be added to. The first time I tried the "Sanatorium" above Drosh, about 6,000 ft., I saw lots of Red-headed Tits (or a near relation), it was early in December ; having got enough to keep us busy I left them till later. I did not see them again though I tried for them several times. I do like watching a hunting party of tits on their rounds, at least two or three sorts in goodly numbers accompanied by Goldcrests, Tree-creepers, Nuthatches, and a few Woodpeckers.

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They are all so busy and tame and there is such a pleasant twittering going on all the time.

(3) *Parus articeps* (THE INDIAN GREY TIT.)

I found this bird fairly common all the year round near Drosh, 4,500 ft. and two pairs nested in holes in walls in the Commissariat lines in Lower Drosh.

(37) *Aegithaliscus leucogenys*—(THE WHITE CHEEKED TIT.)

I never obtained this bird, though I may have seen it. Fulton records it as common in the lower valley.

(44) *Lophophanes melanolophus*—(THE CRESTED BLACK TIT).

Very common from 5,000 feet up in the cedars.

(47) *Lophophanis rufinuchalis*—(THE SIMLA BLACK TIT.)

Same as the last. They are generally found together.

(N. S) *Cyanistes tianschanicus*—(CHINESE BLUE TIT.)

This is an entirely new species discovered by Capt. Fulton. I did not meet it. He only found it at Shost 10,000 ft) where there were numbers in the dense scrub in the river bed in July. He describes it as being like the European Blue Tit but less bright.

## FAMILY—CRATEROPODIDÆ.

As might be expected, this family is poorly represented, but the list would probably be increased a little by beating in the undergrowth in the lower part of the valley.

(91) *Trochalopterum simile*—(THE WESTERN VARIEGATED LAUGHING-THRUSH.)

I only got one at Nagar in November. There were probably lots about which would have been found with beating. Fulton records them as common.

(99) *Trochalopterum lineatum*—(THE HIMALAYAN STREAKED LAUGHING-THRUSH.)

Very common up to about 6,000 feet. Like others of their family they go about in little parties, but they differ in their method of getting from tree to tree or more often from bush to bush. Babblers and other Laughing-Thrushes work up a tree to the top and then "dribble" across to the next by sailing on open wings to the foot of it. *T. lineatum* work up to the top, do a perpendicular dead drop to the ground, and then rapidly "dribble" across to the next by doing a hurried "scuttle", half hop, half fly along the ground. They often scuttle back in apparent alarm, even when more than half way across the open, practice in jinking I suppose. Proficiency in jinking must mean a great deal to them as they usually inhabit a fairly open country abounding in hawks. But the forest dwelling birds do just the same. Chitralis only hawk them when there is absolutely nothing else to be raised; it is nearly impossible to flush them once they have spotted the game. I know no bird harder to hold alive in the hand; a novice has less chance of success than he has of successfully girthing up a hill pony. A small party makes a very interesting addition to an aviary, but the aviculturist with a weak heart is warned off, the oft-repeated impression that some bird has fallen off his perch in a fit is trying. Also



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catching them out with a butterfly net may be regarded as a very severe trial of temper and patience; they hide and jink in an almost impossible way. The "drop" is marvellous, it looks sheer straight, which it cannot be because of the branches. I fear this is rather an avicultural note, will try not to let it occur again.

Oates is of opinion that the subfamily *Crateropodidæ* " probably derive no portion of their food directly from trees, " my observations do not agree with this.

(187) *Myiophoneus temminckii*—(THE HIMALAYAN WHISTLING-THRUSH.)

Common.

(269) *Hypsipetes psaroides*—(THE HIMALAYAN BLACK BULBUL.)

Common summer visitor arriving at the end of April.

*(283) *Molpastes intermedius*—(THE PUNJAB RED-VENTED BULBUL.)

No skin. Only one pair was seen, summer visitors; they nested on the Lower Drosh farm. Practically certain to have been this variety of Red-vented Bulbul.

(284) *Molpastes leucogenys*—(THE WHITE-CHEEKED BULBUL.)

A few present in the winter up to 4,500 feet; numbers greatly increased by summer visitors; only partial migrants, I fancy, arriving in March. They range only slightly higher in summer.

FAMILY—SITTIDÆ.

(320) *Sitta kashmirensis*—(BROOKS'S NUTHATCH.)

No skin, but I identified from the dead bird. Saw some in December and again in May a little over 6,000 feet at the Sanatorium above Drosh among the tits. Not seen again. Fulton reports them as common towards Dir.

(323) *Sitta leucopsis*—(THE WHITE-CHEEKED NUTHATCH.)

Very common in winter down to 6,000 feet among the tits.

FAMILY—DICRURIDÆ.

(327) *Dicrurus ater*—(THE BLACK DRONGO.)

Very common summer visitor up to 5,500 feet. Arrives in mid-April.

FAMILY—CERTHIDÆ.

(341) *Certhia himalayana*—(THE HIMALAYAN TREE-CREEPER.)

Common in winter down to 6,000 feet, often seen among the tits. A few were seen in December as low as 4,500 feet and some were seen at 7,000 feet in June.

(348) *Tichodroma muraria*—(THE WALL-CREEPER.)

Common down to 4,000 feet in winter arriving in October, leaving in early May. One pair (apparently) hung about Drosh fort till early July. Eager, but vain search was made for the nest, I fancy they were weaklings resting, as they re-appeared without young in September.

*(352) *Anorthura neglecta*—(THE KASHMIR WREN.)

Common in winter about Drosh down to 4,000 feet, seemed to have left by

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April. The owner of a Sparrow Hawk in want of something to do often hunts them. Beating the little beggar out (if possible) provides the chief excitement, the hawk being seldom wanted.

° (?).—A tailed wren.

In December about the Lower Drosh farm (about 4,200 feet I think) there were several wrens with long tails hanging about for some time. My two skinners were not at that time up to small birds, and I, thinking they would improve in this line sooner than they did (they never became really reliable with small birds), rather put off shooting small birds, which I thought I could get later. In January I awoke to the fact that these birds were probably a prize. I never saw them again.

FAMILY—REGULIDÆ.

°(358) *Regulus cristatus*—(The GOLDCREST.)

Very common in winter down to 6,000 feet in the cedar forests in parties with tits. A few were seen as low as Drosh Fort. It was also seen in June above Drosh at about 7,500 feet.

FAMILY—SYLVIIDÆ.

I confess to having shied off Warblers, I fancy Capt. Fulton did too. Thanks to Mr. Oates, the identification of a clean, fresh-killed adult specimen is not so formidable as it appears. I am sorry that I did not procure the ones that even I, a tyro in warblers, could discern, without shooting, as being different species. There were only a few such in the main valley, but I saw quite a dozen on my trip up the Mastuj Valley. I only took two skins, which I briefly mention below. I saw birds very like the English Blackcap, Nightingale and Sedge Warbler.

(401) *Sylvia althæa*—(HUME'S LESSER WHITE-THROATED WARBLER.)

°(408) *Phylloscopus indicus*.—(OLIVACEOUS WILLOW-WARBLER.)

Both from near Mastuj. In parts the river bed is covered with reeds and willow; small undergrowth covers the banks, an ideal place for warblers.

(418) *Phylloscopus humii*—(HUME'S WILLOW-WARBLER.)

Not noted by me. Fulton obtained one in April at 10,000 feet and one in September at 6,000 feet.

FAMILY—LANIIDÆ.

(473) *Lanius vittatus*—(THE BAY-BACKED SHRIKE.)

Very common summer visitor, arriving the end of April up to 6,000 feet.

(476) *Lanius erythronotus*—(THE RUFOUS-BACKED SHRIKE.)

Very common summer visitor, arriving beginning of April up to 7,000 feet.

(477) *Lanius tephronotus*—(THE GREY-BACKED SHRIKE.)

I did not meet this bird. Fulton states that he got one specimen in April at Drosh, but is rather doubtful as to his identification being correct.

(495) *Pericrocotus brevirostris*—(THE SHORT-BILLED MINIVET.)

Very common summer visitor. First seen on 9th April at 4,000 feet in Main Valley; common for about a month after at about 4,500 feet; then it went up to 6,000 feet except a few stray birds.

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FAMILY—ORIOLIDÆ.

(518) *Oriolus kundoo*—(THE INDIAN ORIOLE.)

Very common summer visitor, arriving beginning of May up to about 5,000 feet, or perhaps higher as I met it at Reshan.

FAMILY—STURNIDÆ.

°(528) *Pastor roseus*—(THE ROSE-COLOURED STARLING.)

No skin.—It was abundant round Chitral Fort in January.

°(53 ) *Sturnus porphyronotus*—(THE CENTRAL-ASIAN STARLING.)

The only skins I took were in Jinjoret nullah about 7,500 feet in November. I have down a remark "common at about 4,500 feet from November to April" and a similar remark against the next mentioned species, of which I only took skins in March at Kesun about 4,500 feet. It is quite probable that this remark should apply only to the latter—*S. menzbieri*. The birds are indistinguishable except in the hand, a starling was undoubtedly common in those months. It was probably *menzbieri* as Fulton makes a similar remark about that bird and my *prophyronotus* were got higher up. On the other hand both Fulton's skins were taken in February, so both species may have been present low down in winter. On going over my rough field note-book, I note a Central-Asian Starling killed on 2nd April at Drosh.

(532) *Sturnus menzbieri*—(THE COMMON INDIAN STARLING.)

See above. It is more than likely that other similar starlings were present but remained unnoticed by either of us.

(542) *Agropsar sturninus*.—(THE DAURIAN MYNA.)

Not met with by me. Fulton got one cock out of a flock of some 17 birds on 16th July at the head of the Turikho Valley at 11,000 feet.

(544) *Temenuchus pagodarum*—(THE BLACK-HEADED MYNA.)

Very common summer visitor, arriving end of April up to 6,000 feet.

(549) *Acridotheres tristis*—(THE COMMON MYNA.)

Present all the year from 4,000 feet. Did not meet it higher than 6,000 feet.

FAMILY—MUSCICAPIDÆ.

°(557) *Muscicapa grisola*.—(THE SPOTTED FLYCATCHER.)

Fairly common at 7,000 feet in summer, not noticed in winter. They were breeding in June at Baradam 7,500 feet.

(558) *Hemichelidon sibirica*—(THE SOOTY FLYCATCHER.)

Procured at 7,500 feet at Baradam, where it was breeding in June.

(561) *Syphia parva*—(THE EUROPEAN RED-BREASTED FLYCATCHER.)

First seen 14th April when some half-dozen pairs were seen in Lower Drosh. A few were generally to be seen for about a month after. One pair, the only ones I saw during the summer, bred in the Upper Drosh garden. Fulton remarks that it is common in the orchards of Lower Chitral during the winter and as late as mid-April, and that possibly it is a resident. Probably local migration will explain this.

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(589) *Alseonax ruficaudus*—(THE RUFOUS-TAILED FLYCATCHER.)

Fairly common at the Sanatorium nearly 7,000 feet in late May; it bred there later. Fulton records getting one at 4,000 feet in April so it is probably migratory to a certain extent.

(598) *Tersiphone paradisi*—(THE INDIAN PARADISE FLYCATCHER.)

No skin taken. Summer visitor, not numerous, nor seen as high as Drosh. First seen end of April.

FAMILY—TURDIDÆ.

The waste stretches along the main valley between the cultivated bits on the side streams provide grand ground for finches, accentors, and especially for chat-like birds. Keeping in view that such birds have always been of the greatest interest to me, that the river, orchards, and cultivated lands could be worked on the same day, and that my job necessitated frequent trips up and down the main valley, it is small wonder that such ground received a good deal more than its fair share of attention, especially during March and April, the spring migratory season. My notes fully meet my requirements as regards dates, &c., of arrival, departure, occurrence, nesting observations, &c.; but they sadly fail in the few instances where descriptions are required. In the case of the Chats my notes give the impression of having been bothered by the variations of plumage, *S. picata* and *S. pleschanka* being the offenders. Mention is made of a mixed marriage, but the name of the lady is unaccountably omitted. I must content myself with leaving disputed points alone. I hope these remarks will induce some other sojourner in Chitral or similar district to take up the question. I wish I had made a larger series of skins.

(608) *Pratincola caprata*—(THE COMMON-PIED BUSH-CHAT.)

Not seen by me. See also *P. maura*. Capt. Fulton remarks as under :—

"A resident. I obtained specimens among the scrub on the banks of the streams at 6,000 feet in the Bimboret nalla in February. I did not see them again till September, when large numbers arrived at Drosh evidently migrating south. I believe they breed in the country."

This remark was originally made against *P. maura*, but was subsequently corrected by him to refer to *caprata*.

(610) *Pratincola maura*—(THE INDIAN BUSH-CHAT.)

A few were observed near Drosh in March, but the bulk of them arrived early in April. Most went further north or scattered, but a few bred between Drosh and Chitral, at least three pairs. Capt. Fulton added this to his original list at the same time that he made the correction about *P. caprata*. His amended remark reads :—

"I obtained one male only of this species in the Golan Valley in May at 6,000 feet."

Knowing both these chats well, I could hardly help thinking that Capt. Fulton had made a slip in their names. Mr. Kinnear kindly looked up his specimens and found four *maura* and one *caprata*, so it is evident that in his correction alluded to, *maura* should read *caprata* and *vice versâ*.

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°(618) *Saxicola picata*—(THE PIED-CHAT.)

Arrived mid-April. Common. Breeds in the country about 5,000 feet upwards.

(619) *Saxicola capistrata*—(THE WHITE-HEADED CHAT.)

Not recorded by me, though I am not at all sure that I did not see it putting it down as a variety of *S. picata*. Fulton records it :—

"I obtained specimens at elevations of 7,000 to 11,000 feet during May, June and July. In May I found a nest at 7,500 feet at the foot of a small shrub."

(620) *Saxicola opistholeuca*—(STRICKLAND'S CHAT.)

By far the commonest Chat. First seen late in March, large numbers arrived early in April, scattered in early May, began to collect again with their young early in October. Bred from 5,000 up, many along the banks of the main river. The cock of my "mixed marriage" belonged to this species. The hen, I am nearly sure, belonged to *S. picata*. The hens of this species are very much darker than and easily distinguishable at sight from those of *picata*. Nests with young were common early in June.

°(621) *Saxicola pleschanka*—(THE SIBERIAN CHAT.)

Arrives a trifle earlier and is not so common, otherwise the remarks concerning *opistholeuca* apply also to this chat.

°(624) *Saxicola œnanthe*—(THE WHEATEAR CHAT.)

Not common. First seen 2nd April. One pair nested on the Lower Drosh farm about 4,200 feet.

°(628) *Saxicola chrysopygia*—(THE RED-TAILED CHAT.)

Rare, only a few seen in January and early February, near Drosh by the river on a waste stretch about 4,300 feet.

(630) *Henicurus maculatus*—(THE WESTERN SPOTTED FORKTAIL.)

Common on side streams, down to 4,000 feet in winter and a bit higher in summer. Breeds about 5,000 feet upwards.

(637) *Microcichla scouleri*—(THE LITTLE FORKTAIL.)

Common in winter down to 4,000 feet on side streams. Disappeared from mid-April till early in September. The Drosh Fort pair hung about till the end of June, when they too vanished after giving us false hopes of finding the nest. I have frequently seen them (in Chitral and elsewhere) plunge into the water ; in fact, I think, they get most of their food in this way. They always go up stream and apparently run along the bottom perhaps aided a bit by their wings, which seem to be kept half-open. I have seen them go up a steepish rock half-a-dozen times in about as many minutes, resting a little at the top and then flying to the bottom for another trip up, the water little more than covering the bird, but coming down with a force which, one would think, would render successful ascent on the apparently slippery surface impossible. I have seen them plunge but not so often in deeper and stiller water. They are not shy birds to start with, and, by only advancing when they are under water, one can get quite close. Fulton states that he never saw them plunge, and that they seemed to stick more to scrub, seldom being near the water like *H. maculatus*. My subsequent trapping experiences give the explanation of this,

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*i.e.*, that he did not see them feeding. They only feed in the morning (fairly early), about mid-day, and then again in the evening, retiring to adjoining scrub for siesta between whiles. Of course this only applies to my experiences, *i. e.*, between November and March. About 3 p.m. one day I marked one going into a small bush on a bare cliff overhanging the main branch of a stream near here. To the best of my belief he did not move till 6 p. m., when he came down to feed. I am sure my presence had nothing to do with his stopping there. I was some way off on the other side of the stream bed (fairly wide just there), trying to trap White-capped Redstarts on the other minor bifurcation of the stream, which was not his hunting ground at all. Several times after, a stone thrown into that bush from above at non-feeding times found him at home. The one specimen caught at last did not survive long, not enough individual attention at first I fear. His larger relative, though I did not succeed in even getting him on boardship, did very well in my aviaries; this bird is also given to siestas, but they are shorter.

(638) *Chimarrhornis leucocephalus*—(The White-capped Redstart.)

Fairly common in winter along streams down to 4,000 feet going up higher in April. Seen in June about 6,500 feet. Fulton states that it is common in summer by streams from 7,000 to 12,000 feet. Like other stream-hunting birds it seems to divide off the stream into stretches. Each bird (or pair) sticks to it's own stretch, fighting off intruders.

(639) *Ruticilla frontalis*—(The Blue-fronted Redstart.)

No specimen obtained, but an unidentified Redstart twice noted near Drosh in February, belonged I am nearly sure to this species, which I afterwards got to know well, as an occasional winter visitor to my station.

(642) *Ruticilla erythronota*—(Eversmann's Redstart.)

Very common down to 4,000 on the waste stretches bushed parts in winter from November to February. Not seen after middle of March.

(644) *Ruticilla rufiventris*—(The Indian Redstart.)

First seen in mid-April about 4,500 feet round Chitral Fort where it was fairly common and remained so for a short time. It was common up the Mastuj Valley in May. Not seen again till September when it was fairly common round Drosh.

(644 *a*). *Ruticilla phoenicura.*—(The European Redstart.)

This is the first authentic specimen of this Redstart that has been recorded from British India, according to Mr. Comber. I only met with it at Buni up the Mastuj Valley, where it was common on both my visits in the middle of May. I only took three skins.

(645) *Ruticilla erythrogaster*—(Guldenstadt's Redstart.)

Only seen (bar one pair) in March and April, when it was common on the river and side streams about 4,500 feet. One pair hung about Lower Drosh till the end of June, giving us vain hopes of finding the nest. A pair (I fancy the same) were frequenting the same place in September. This attractive and conspicuous Redstart has, as Oates remarks, much the same habits as the

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White-capped. It certainly also frequents rocky hill-sides as long as they are fairly close to water, I observed it hawking flies at a great height which I have never seen the White-capped do.

(646) *Rhyacornis fuliginosus*—(THE PLUMBEOUS REDSTART.)

Resident. Common in winter from 5,000 feet down and in summer from 4,000 to 6,000 feet possibly higher, but I do not think this bird moves up and down very much, though in India I have met both this and the White-capped in the plains at the edge of the foot-hills. The hen's helio like tail is most fascinating to watch. The cock has a charming little song, a fact I was unaware of till I kept them in my aviaries where the cocks were incessantly singing at each other through the very necessary wire separating them. The White-caps often fought but never sang.

(647) *Cyanecula suecica*—(THE INDIAN BLUE-THROAT.)

Not observed by me. Fulton records it as passing through Drosh going south in September and October.

(651) *Calliope pectoralis*—(THE HIMALAYAN RUBY-THROAT.)

Two were put up out of a wheat field and the cock bagged, when after quail near Chitral Fort on 21st April. No more were seen, but birds of habits like this and the last are easily missed. The cock, as I have since ascertained, has a beautiful song.

(657) *Adelur cæruleicephala*—(THE BLUE-HEADED ROBIN.)

Not observed till early in March, when they were common from 4,000 feet upwards. They began to move higher up in April, but were present all the summer from 6,000 up. Major Sealy found a nest in a crevice under a fallen tree on 31st May on Kaogol about 7,000 feet. It contained four eggs of the type recorded by Wardlaw Ramsay.

(677) *Merula atrigularis*—(THE BLACK-THROATED OUZEL.)

Very common from 4,500 feet upwards from March till May, appearing again in October.

(678) *Merula unicolor*—(TICKELL'S OUZEL.)

No skin taken though several were shot and identified. Very common from March to May. Began to go up higher in May. A pair seen in June at 7,500, above Drosh. Seen again low down in end of September.

(691) *Petrophila cinclorhynca*—(BLUE-HEADED ROCK THRUSH.)

No skin. It is a bird I know well. Several pairs were seen in the summer in different places at about 7,000 feet or under. I saw it again with young in not fully adult plumage low down in October. I cannot understand my missing it on its way up. Fulton records it at 7,000 feet in May. MacMahon I believe, records the occurrence of the Chestnut-bellied Rock-Thrush (*P. erythrogastra*), but I cannot help thinking he misnamed this bird (*cinclorhynca*), a mistake commonly made.

(693) *Petrophila cyanus*—(THE WESTERN BLUE ROCK-THRUSH.)

First seen at the end of April, when it became very common till the end of May when they seemed to scatter. It remained fairly common from 4,500, up

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all the summer breeding even at the lower elevation. They began to collect again in the main valley in September.

(694) *Monticola saxatilis*—(THE ROCK-THRUSH.)

Not met with by me. Fulton records obtaining two females in September and October at 7,000 feet. "The former with an egg." Doubtless a precocious youngster.

(695) *Turdus viscivorus*—(THE MISSEL-THRUSH.)

Common in winter down to 4,500 feet and in summer down to about 6,500 feet, at which altitude I found a nest with four young on 28th May. Fulton records a nest at 12,000 feet, the bird, nests with four eggs, and tree being covered with snow on 26th April.

Probably other thrushes will be recorded. I am nearly sure that I saw Redwings in February near Drosh.

(703) *Cinclus asiaticus*—(THE BROWN DIPPER.)

Common from 4,000 feet up, going a bit higher in summer. A nest was found at Beori at 4,000 feet on 15th March with four practically fully fledged young and another at Ayon on 5th April at 4,500 feet with 5 young in the down.

* (712) *Accentor nepalensis*—(THE EASTERN ALPINE ACCENTOR.)

Fairly common round Drosh in November and March not lower than 6,000 feet, very common in small straggling flocks down to 4,500 feet along the roads from December to February. One was seen at 7,500, above Drosh on 8th April.

(716) *Pharrahaleus atrigularis*—(THE BLACK-THROATED ACCENTOR.)

Common in small parties of a dozen or so round Drosh down to 4,000 feet, from November to March. A few seen in pairs to April about 5,000 feet.

(717) *Pharrhaleus fulvescens*—(THE BROWN ACCENTOR.)

Not quite so common, arrives a little later, departing earlier and keeps a bit higher, not seen in April, otherwise similar to above.

FAMILY—PLOCEIDÆ.

(734) *Uroloncha malabarica*—(THE WHITE-THROATED MUNIA.)

No skin. Only one small flock seen below Drosh on 3rd May. Fulton records them common in summer up to 4,000 feet.

FAMILY—FRINGILLIDÆ.

The list of "finches" is fairly long, but I am sure it can be added to.

(740) *Coccothraustes humii*—(HUME'S HAWFINCH.)

Not obtained, but I think I saw it near Gairat in May. Fulton records two specimens from Drosh in May, and believes that it breeds in the country.

* (741) *Pycnorhamphus icteroides*—(THE BLACK AND YELLOW GROSBEAK.)

Not uncommon in the cedar forests, down to about 6,500 feet in winter.

* (745) *Pyrrhula aurantiaca*—(THE ORANGE BULLFINCH.)

Only one hen obtained, sent in to me from Utzum about 7,500 feet on 29th March. A cock Bullfinch hung about the inside of Chitral Fort for most of January, I only saw it once, but believe it belonged to this species.



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(754) *Propasser thura*—(THE WHITE-BROWED ROSE-FINCH.)

Not observed by me. Fulton records obtaining one cock on 30th April in Pattison nallah at 9,000 feet.

(755) *Propasser pulcherrimus*—(THE BEAUTIFUL ROSE-FINCH.)

Not observed by me. Fulton records them common during April in the cedar forests between 6 000 and 10,000 feet, not seen in summer.

(757) *Propasser grandis*—(THE RED-MANTLED ROSE-FINCH.)

A few were met with in January and April about 4,500 feet on the waste stretches. Fulton records them as fairly common on the wooded ridges from 7,000 to 9 000 feet in late April and early May.

(761) *Carpodacus erythrinus*—(THE COMMON ROSE-FINCH.)

Very common in large flocks at about 4,500 feet at end of April and beginning of May. Seen up the Mastuj Valley in mid-May. Fulton records them common at the head of the Turikho Valley from 15,000 to 16,000 feet probably breeding there, and common in winter round Drosh.

(762) *Carpodacus severtzovi*—(SEVERTZOFF'S ROSE-FINCH.)

Not met with by me. Fulton records a good many at Gharagar at 13,000 feet just below the snow-line on 10th July.

(763) *Erythrospiza githaginea*—(THE DESERT-FINCH.)

One specimen obtained. Not so common as the next species.

(764) *Erythrospiza mongolica*—(THE MONGOLIAN DESERT-FINCH.)

There were large flocks present in the main valley near Ghairat and further in March, April, and May. A few were seen in November. These flocks contained smaller flocks of two somewhat similar birds, differing a bit in habits. One species, *mongolica*, was far commoner than *the other githaginea*. Fulton records getting a pair at the head of the Turikho Valley at 10,000 feet on 9th July.

(764a) *Rhodopechys sanguinea.*

Not seen by me. Fulton saw two (of which he got one) at Roah in the Turikho Valley at 10,000 feet which constitutes the first record within Indian limits.

(764b) *Rhodospiza obsoleta.*

No skin. A few were several times seen in November just above the junction of the Shishikho with the main river. They used to be procurable alive most winters in Pindi or Lahore under the name of "Kabul Gulabi," but I have heard of none for the last few years. I believe they have since been recorded from Quetta, so my omission to procure a skin is not of much consequence.

(767) *Carduelis caniceps*—(THE HIMALAYAN GOLD-FINCH.)

Fairly common in small flocks at about 4,500 feet in the winter from November to March, collecting in large flocks in April previous to going further up the hill. Seen in large flocks at Buni in mid-May. Fulton records them as common in summer at about 12,000 feet, breeding in July.

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(768) *Callacanthis burtoni*—(THE RED-BROWED FINCH.)

Not observed by me. Fulton records it as summer visitor, getting specimens in the Deodars in August from 8,000 to 9,000 feet.

(770.) *Acanthis brevirostris*—(THE EASTERN TWITE.)

Not observed by me. Fulton records it as fairly common on the high grazing grounds from 10,000 to 14,000 feet in July and August; he obtained a nest at 13,000 feet.

(771) *Metoponia pusilla*—(THE GOLD-FRONTED FINCH.)

Fairly common in small flocks at about 4,500 feet from November to March collecting in large flocks, probably increased by new arrivals in April, a few seen in May at that height. Fulton records them common on the Turikho at 12,000 feet where they were nesting in July.

(774) *Fringilla montifringilla*.—(THE BRAMBLING.)

Only observed in April when large flocks passed through Drosh on their way north.

(776) *Passer domesticus*—(THE HOUSE-SPARROW.)

Arrive end of April (first seen 20th), beginning to leave early in October, very common at about 4,500 feet. Nested mostly in holes in trees, only a few apparently finding sites in the houses, such being previously occupied by *P. montanus*. Several colonies were found nesting fairly high up in the smaller branches of trees in the orchards. The nest consisted of a large untidy ball of straw, in the middle of which was the nest proper of hay and the usual rubbish; the entrance at the side was not easy to detect. Fulton noted it as far up the valley as Sanoghar 7,800 feet.

(778) *Passer hispaniolensis*—(THE SPANISH SPARROW.)

Very common in large flocks round Drosh in October and November, not seen in winter nor in summer. Arrived in large flocks right at the end of April staying only about a fortnight.

(779) *Passer montanus*—(THE TREE SPARROW.)

Very common all the year, from 4,000 feet up, nesting from April to August, mostly in buildings, as far as such accommodation went. My notes tally exactly with Fulton's.

(780) *Passer cinnamomeus*—(THE CINNAMON TREE-SPARROW.)

Fairly common in small parties in the lower wooded valleys at 4,000 feet in winter. Fairly large flocks seen near Drosh in April. Met breeding in May at about 6,000 feet, not seen lower than this in summer.

(787) *Fringillauda sordida*—(STOLICZKA'S MOUNTAIN-FINCH.)

Several small flocks seen near Drosh at about 5,000 feet in early April. Fulton records having seen them at 6,000 feet in April and May, and found them common at 10,000 to 14,000 feet in July.

(788) *Fringillauda brandti*—(BRANDT'S MOUNTAIN-FINCH.)

Not observed by me. Fulton found them numerous in Bangol at 13,000 feet up in July, but saw them nowhere else.

(790) *Emberiza fucata* —(THE GREY-HEADED BUNTING.)

No skin. I shot and identified this bird at Reshan in the Mastuj Valley

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in May, fairly common. Not observed elsewhere, but may have been present.

° (792) *Emberiza leucocephala*—(THE PINE-BUNTING.)

Common about Drosh in December and January becoming very common in February and March. None seen in April or later.

(793) *Emberiza stewarti*—(THE WHITE-CAPPED BUNTING.)

Not seen in winter. Were very common in the main valley at about 5,000 feet towards the end of April and a bit higher up in May. Breed in June and July as low as 5,500 feet, not uncommon.

(794) *Emberiza stracheyi*—(THE EASTERN MEADOW-BUNTING.)

Common in winter down to 4,000 feet from October to early May, when they go higher up, probably found above 8,000 feet, according to my notes. Fulton saw numerous young in June and July at 9,000 to 14,000 feet.

° (795) *Emberiza buchanani*—(THE GREY-NECKED BUNTING.)

Only one cock obtained in May at 5,000 feet; but there were probably others also feeding with the flocks of *stewarti* and *stracheyi*. It is very likely that other buntings were also present but undetected.

° (799) *Emberiza melanocephala*—(THE BLACK-HEADED BUNTING.)

No skin preserved and identification not quite certain. They were common about Drosh in late October. The skins I took were not "in plumage" and were destroyed by some puppies. However, I got to know this bird well afterwards through keeping it alive, and am nearly sure my identification was correct.

(800) *Emberiza luteola*—(THE RED HEADED BUNTING.)

Only one pair obtained on 2nd and 3rd May near Drosh, no more seen till late September when, what I am nearly sure was this species, were fairly common. Fulton records them as arriving towards the end of March on the northward migration.

(801) *Emberiza rutila*—(THE CHESTNUT BUNTING.)

Not met with by me. Fulton records obtaining only one male in the Golan Valley at 7,000 feet in April.

FAMILY—HIRUNDINIDÆ.

(805) *Chelidon kashmiriensis*—(THE KASHMIR MARTIN.)

Common in summer, arriving in late April. Breeds about 4,500 feet.

(808) *Cotile riparia*—(THE SAND-MARTIN.)

Not observed by me. Fulton notes as common from April to October.

(810) *Ptyonoprogne rupestris*—(THE CRAG-MARTIN.)

Summer visitor, common, arrived early April, breeds from 4,500 feet. Fulton met it at 13,000 feet.

° (813) *Hirundo rustica*—(THE SWALLOW.)

Common summer visitor, arrived early May, breeds at 4,500 feet.

(824) *Hirundo rufula*—(THE EUROPEAN STRIATED SWALLOW.)

Common summer visitor, arriving the end of March. Breeds from 4,000 feet. An unfinished nest was found on 8th May as low down as Nagar.

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## FAMILY—MOTACILLIDÆ.

(826) *Motacilla alba*—(THE WHITE WAGTAIL.)

First seen early in April, common; breeds at about 5,000 feet. Fulton records it as present through the year from 4,000 to 10,000 feet, according to season.

(829) *Motacilla personata*—(THE MASKED WAGTAIL.)

Common throughout the year breeds at about 5,000 feet in May-June.

(830) *Motacilla hodgsoni*—(HODGSON'S PIED WAGTAIL.)

First observed 25th March, but on sight without careful observation it is except in summer, so like the last that it may have easily escaped observation. A specimen obtained on 25th March had all the "back parts" pure black, while another killed on the 6th April had only traces of black on those parts as had others killed some time later Both species were breeding within a few yards of each other at Ayon in June, where both were common. There was one case of an apparent "mixed marriage," but they had young, and I did not like to take the parents.

(832) *Motacilla melanope*—(THE GREY WAGTAIL.)

Present in the winter, but not common, about 4,500 feet, going higher up in summer. Large numbers present near Drosh in April. Breed as low down as 5,500 feet, but commoner a bit higher.

(835) *Motacilla beema*—(THE INDIAN BLUE-HEADED WAGTAIL.)

Not recorded by me, but I think some Wagtails I saw in April were of this species. Fulton records them as passing through in numbers in April.

(838) *Motacilla citreoloides*—(HODGSON'S YELLOW-HEADED WAGTAIL.)

Arrived in fair numbers at the end of March on the way up higher (or further north). Some stay for the summer as low as 6,000 feet but not common, apparently breeding. Fulton met one pair at 10,000 feet in July. Some of my specimens obtained in March (along with undoubted *citreoloides*) had no trace of black on the upper parts, and may, of course, be *M. citreola*.

(840) *Anthus trivialis*—(THE TREE-PIPIT.)

First observed at the beginning of April, quite common at about 4,500 feet in April and May, disappearing (probably to go higher) in June, re-appearing early in September. Fulton believes it to be present through the year from 5,000 to 12,000 feet according to season.

(844) *Anthus similis*—(THE BROWN ROCK PIPIT.)

A fairly common summer visitor, appearing at the beginning of April, at about 4,500 feet and breeding about that height.

*Anthus, sp.*—(A PIPIT.)

A pipit was very common in winter at about 4,500 feet, disappearing in the middle of March. Unfortunately the only two skins I took were destroyed. I put it down as *A. sordidus*; it was like *A. similis*, but not so large or bright, and the third outer tail feathers were "pale-tipped," the legs were dark reddish-brown.

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FAMILY—ALAUDIDÆ.

(855) *Otocorys penicillata*—(GOULD'S HORNED LARK.)

There were two flocks of about a dozen each near Ghairat about 5,000 feet in the early part of March. I saw a few near Laspur, pretty close to the Shandur Lake in May. Fulton saw them at 13,000 feet at the head of the Turikho in July.

(859) *Melanocorypha bimaculata*—(THE EASTERN CALLANDRA LARK.)

Large flocks passed up the main valley during early March.

(860) *Alauda arvensis*—(THE SKY-LARK.)

Some present in the winter low down, very common in March, some present in April after which they disappeared, probably going higher. Fulton obtained fully fledged young at 11,000 feet at the end of June.

(862) *Calandrella brachydactila*—(THE SHORT-TOED LARK.)

Very common in small flocks in April as they passed through Drosh. Fulton notes their return southward, passing through Drosh in large numbers in first week of October.

(864) *Calandrella tibetana*—(BROOKS'S SHORT-TOED LARK.)

Not observed by me. Fulton records two from Sonoghar (8,000 feet) in May.

° (865) *Calandrella acutirostris*—(HUME'S SHORT-TOED LARK.)

Two obtained at Orgutz on 10th May, indistinguishable at sight from *brachydactyla*. Seen in small flocks.

°(874) *Galerita cristata*—(THE CRESTED LARK.)

A not common summer visitor, arriving in mid-April, remaining to breed, not seen much above 4,200 feet.

FAMILY—PICIDÆ.

(946) *Gecinus squamatus*—(THE WEST-HIMALAYAN SCALY-BELLIED GREEN WOODPECKER.)

Common throughout the year from 4,000 feet up.

(961) *Dendrocopus himalayensis*—(THE WESTERN HIMALAYAN PIED WOODPECKER.)

Common throughout the year from about 5,000 feet up.

(969) *Dendrocopus auriceps*—(THE BROWN-FRONTED PIED WOODPECKER.)

Not observed by me. Fulton records it as common from 4,000 to 11,000 feet.

(1003) *Iynx torquilli*—(THE COMMON WRYNECK.)

Only one specimen obtained at Drosh on 2nd May at about 4,300 feet.

FAMILY—CORACIADÆ.

(1024) *Coracias garrula*—(THE EUROPEAN ROLLER.)

Arrive the beginning of May, most pass on northward after a short stay, but a fair number breed in the country. They seem far more secretive about their nests than the Indian Roller. It was not till they had young (in mid-July) that we discovered a nest in a tree in the cliff over hanging the river by Lower Drosh, and then only by a fluke.

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FAMILY—MEROPIDÆ.

(1029) *Merops apiaster*—(THE EUROPEAN BEE-EATER.)

Arrive the end of May, most passing on northward, but a number stay to breed in the country at about 4,500 feet, young seen about in August. One nest we dug out on 20th September contained a young bird, fully fledged; in fact, it must have left the nest a long time.

FAMILY—ALCEDINIDÆ.

*(1035) *Alcedo ispida*—(THE COMMON KINGFISHER.)

Several were seen in April on the main river between Nagar and Kesun. Solitary birds were seen on the same part at intervals all the year.

FAMILY—UPUPIDÆ.

(1066) *Upupa epops*—(THE EUROPEAN HOOPOE.)

Fairly common summer visitor, first seen about 4,500 feet at the end of March going up a good deal higher at the end of April. I met it some way above Laspur in May.

FAMILY—CYPSELIDÆ.

(1068) *Cypselus melba*—(THE ALPINE SWIFT.)

Common in summer passing overhead, arriving end of March.

(1069) *Cypselus apus*—(THE EUROPEAN SWIFT.)

Very common summer visitor, arriving in mid-April.

FAMILY—CUCULIDÆ.

(1104) *Cuculus canorus*—(THE CUCKOO.)

Fairly common summer visitor from 4,500 feet up, first seen end of April.

FAMILY—PSITTACIDÆ.

(1141) *Palæornis schisticeps*—(THE SLATY-HEADED PAROQUET.)

Fairly common summer visitor at 4,000 feet up, arriving early in April.

FAMILY—ASIONIDÆ.

*(1156) *Asio otus*—THE LONG-EARED OWL.

One specimen obtained at Drosh on 2nd May.

(1159) *Syrnium biddulphi*—(SCULLY'S WOOD-OWL.)

Fairly common I fancy in winter about 4,500 feet, not observed in summer.

(1167) *Bubo ignavus*—(THE GREAT HORNED OWL OR EAGLE OWL.)

No skin, but there was a bird which could only have been of this species hanging about the Lower Drosh farm for a week or so in December. Fulton records getting two in December in Drosh.

(1173) *Scops giu*—(THE SCOPS OWL.)

Every orchard from 4,000 feet up seems to hold this bird in summer, not noted in winter, the whistle-hoot "hoo-hoo" was first heard in April. I took some young in down of various ages from a nest on 13th July, and most charming pets the comical little chaps made.

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°(1186) *Glaucidium brodiei*—(THE COLLARED PIGMY OWLET.)

Only one specimen obtained at about 5,000 feet in February. Probably many other owls are present.

FAMILY—VULTURIDÆ.

(1198) *Neophron percnopterus*—THE EGYPTIAN VULTURE OR LARGE WHITE SCAVENGER VULTURE.

No skin, I rather fancy both species were present round Drosh in summer.

FAMILY—FALCONIDÆ.

Chitral abounds in "hawks" as one would expect, and I am sure the list could be doubled. It seems a shame to shoot some species. I still regret having shot a magnificent Fishing Eagle at the instance of a Chitrali who feared for his hawks. Some on the other hand are so numerous that they become a nuisance and have to be treated as vermin.

(1199) *Gypætus barbatus* (THE BEARDED VULTURE OR LAMMERGEYER.)

No skin. Common throughout the year, down to 4,000 feet in winter.

(1208) *Hieræetus pennatus*—(THE BOOTED EAGLE.)

This bold bird is common from 4,000 feet up. Chitralis dislike him immensely, as his presence in the neighbourhood renders hawking an impossibility. I have never seen one domesticated (I hope falconers will excuse my ignorance of correct terms). In spite of its rather clumsy build, it can put the fear of death into a laden shahin, which is itself a marvellous flyer.

° (1223) *Haliætus leucoryphus*—(PALLAS'S FISHING-EAGLE.)

One specimen obtained out of a pair near Chitral Fort on 10th May.

° (1229) *Milvus govinda*—(THE COMMON PARIAH KITE.)

No skin. I am under the impression that this and *M. melanotis* were present round Drosh in the summer, but cannot be sure.

(1230) *Milvus melanotis*—(THE LARGER INDIAN KITE.)

No skin. Fulton records one specimen obtained at 6,000 feet on 16th April.

(1232). *Elanus cæruleus*.—(THE BLACK-WINGED KITE.)

Not observed by me, though doubtless I saw it, as Fulton says it is common in summer in the lower wooded valleys.

(1233). *Circus macrurus*—(THE PALE HARRIER.)

Not observed by me, but there were many harriers in the main valley in April and May. Fulton records one from Drosh in April.

° (1234) *Circus cyaneus*—(THE HEN HARRIER.)

Two specimens obtained in April and May below Drosh.

° (1237) *Circus æruginosus*—(THE MARSH HARRIER.)

Two specimens obtained in April and May below Drosh.

° (1243) *Astur palumbarius*—(THE GOSHAWK.)

Not seen by me. They are caught in the higher ranges.

(1247) *Accipiter nisus*—(THE SPARROW HAWK.)

Saw several of what were probably this bird in April and May. I saw a good many fresh-caught ones obtained at no great height. Fulton got it.

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(1255) *Falco peregrinator*—(THE SHAHIN FALCON.)

Met with several times. Near Drosh on 27th April I shot one which was carrying a Myna. The Myna escaped when I shot the falcon. About the finest flying spectacle I have ever seen was given by a wild bird hawking a tame one. I do not think the owner was as pleased as I. To my mind hawking crows with a Peregrine or Shahin is far finer than going for Chukor with a Goshawk.

(1260) *Falco subbuteo*—(THE HOBBY.)

Not noted by me. Fulton records one from Reshan, 6,000 feet in May.

(1264) *Æsalon chicquera*—(THE TURUMTI OR RED-HEADED MERLIN.)

Not seen by me. At Reshan in May I saw one freshly caught near by.

(1265) *Tinnunculus alaudarius*—(THE KESTREL.)

Common throughout the year from 4,000 feet up, especially in March and April.

## FAMILY—COLUMBIDÆ.

(1292) *Columba intermedia*—(THE INDIAN BLUE ROCK-PIGEON.)

Flocks of Blue pigeon were common in the winter at about 5,000 feet, but it was impossible to tell which form they belonged to, except those that were shot I identified a good many beside those I shot myself. From December to March only *intermedia* and *rupestris* were obtained, in April only *livia* were obtained. Fulton records *intermedia* as common up to 10,000 feet.

(1293) *Columba livia* (THE BLUE ROCK-PIGEON.)

(1294) *Columba rupestris*—(THE BLUE HILL PIGEON.)

(1296) *Columba leuconota*—(THE WHITE-BELLIED PIGEON.)

Common in winter down to about 5000 feet. Fulton found them not uncommon in summer from 11,000 to 14,000 feet.

(1298) *Palumbus casiotis*—(THE EASTERN WOOD-PIGEON, RING-DOVE, OR CUSHAT.)

Seen in the wooded parts in small parties in November and again in May at about 6,000 feet, and in larger parties in July.

(1305) *Turtur ferrago*—(THE INDIAN TURTLE-DOVE.)

A common summer visitor from 4,000 feet up, arriving end of April.

(1307) *Turtur suratensis*—(THE SPOTTED DOVE.)

A common summer visitor arriving end of April, from 4,000 feet up.

(1309) *Turtur cambayensis*—(THE LITTLE BROWN DOVE.)

Remarks as for *T. ferrago*.

(1310) *Turtur risorius*—(THE INDIAN RING-DOVE.)

Remarks as for *T. ferrago*.

## FAMILY—PHASIANIDÆ.

(1334) *Pucrasia macrolopha*—(THE KOKLAS OR PUKRAS PHEASANT.)

Not observed by me, but it is without doubt common, see Fulton's notes. A live bird caught at about 7,000 feet above Drosh was brought in to me in November.



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(1342) *Lophophorus refulgens.*—(THE MONAL.)

No skin. Common in winter at 6,000 feet occasionally as low as 5,000 feet. Fulton records it at 10,000 feet and higher in summer.

(1355) *Coturnix communis*—(THE COMMON OR GREY QUAIL.)

Fair number continue passing through the country throughout April and May.

(1370) *Caccabis chucar*—(THE CHUKOR.)

Very common all the year coming down as low as 4,000 feet in winter. Fulton records it as high as 12,000 feet in summer.

(1378) *Tetraogallus himalayensis*—(THE HIMALAYAN SNOW-COCK.)

Common in winter as low down as 6,000 feet. Fulton records them with young in July between 15,000 and 16,000 feet.

## FAMILY—RALLIDÆ.

In all probability many species pass through on migration in April and May. Two rails were brought in to me in May. Their condition (crawling) was no inducement to prolonged identification. I put them down as *Porzana parva* and *P. maruetta*.

* (1402) *Gallinula chloropus*—(THE MOORHEN.)

One obtained at Nagar on 30th March, fairly common passing through in May.

(1405) *Fulica atra*—(THE COOT.)

One obtained at Drosh on 15th February, fairly common passing through in end of April and beginning of May.

## FAMILY— HARADRIIDÆ.

(1436) *Vanellus vulgaris*—(THE LAPWING OR PEEWIT.)

Fairly common in winter in the main valley, not seen after May.

(1437) *Chettusia gregaria*—(THE SOCIABLE LAPWING.)

Remarks as for the Peewit.

* (1447) *Ægialitis dubia*—(THE LITTLE RINGED PLOVER.)

Fair number pass through in April.

* (1454) *Numenius arquata*—(THE CURLEW.)

A few pass through at end of April.

(1460) *Totanus hypoleucus*—(THE COMMON SANDPIPER.)

Specimens only obtained at end of April, evidently passing through.

(1461) *Totanus glareola*—(THE WOOD SANDPIPER.)

Remarks as for *T. hypoleucus*.

(1462) *Totanus ochropus*—(THE GREEN SANDPIPER.)

Specimens obtained throughout the year at about 4,500 feet, commonest at end of April. They bred near Drosh.

* (1464) *Totanus calidris*—(THE REDSHANK.)

A few pass through at end of April.

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(1471) *Tringa minuta*—(THE LITTLE STINT.)

Not observed by me. Fulton records them as common in April and May. On migration.

(1480) *Phalaropus hyperboreus*—(THE RED-NECKED PHALAROPE.)

Not noted by me. Fulton obtained one at Drosh on 14th September.

(1482) *Scolopax rusticula*—(THE WOODCOCK.)

No skin, noted at several places in the main valley during April. Fulton records them as not numerous, but present all the year in the wooded valleys of Lower Chitral. He found them in June at 7,000 feet and notes that they evidently breed in the country.

(1484) *Gallinago cœlestis*—(THE FANTAIL SNIPE.)

A few were seen for about a week in early March. Seen again and more numerous from mid-April to end of May.

(1486) *Gallinago solitaria*—(THE HIMALAYAN SOLITARY SNIPE.)

Not noted by me for certain, but am nearly sure I saw this bird at Drosh in January and again near Ayon at 5,500 feet in April. Fulton records a few.

(1487). *Gallinago gallinula*—(THE JACK SNIPE.)

A few present in the middle of May, on migration.

FAMILY—LARIDÆ.

(1490) *Larus ridibundus*—(THE LAUGHING GULL.)

A few pass up from end of March to end of May.

(1495) *Larus cachinans*—(THE YELLOW-LEGGED HERRING-GULL.)

One obtained in January at Drosh.

(1496) *Hydrochelidon hybrida*—(THE WHISKERED TERN.)

Fairly numerous in middle of May between Buni and Reshan. None seen there a week later, apparently on migration.

(1499) *Sterna anglica*—(THE GULL-BILLED TERN.)

A fair number of Terns passed up during end of April and May. Those obtained (two) were of this species.

FAMILY—PHALACROCORACIDÆ.

(1526) *Phalacrocorax carbo*—(THE LARGE CORMORANT.)

A few pass up in early March, more in April.

FAMILY—ARDEIDÆ.

(1555) *Ardea cinerea*—(THE COMMON HERON.)

A few passed through during April and May.

(1561) *Herodias garzetta*—(THE LITTLE EGRET.)

One specimen only obtained below Drosh on 8th May. No more seen.

FAMILY—ANATIDÆ.

(1583) *Anser indicus*—(THE BARRED-HEADED GOOSE.)

Not seen by me, but geese were heard passing in March. I saw the tamed birds mentioned by Fulton.

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(1592) *Anas boscas*—(THE MALLARD.)

Pass southwards end of October, perhaps earlier, pass northwards during March.

(1593) *Anas pœcilorhyncha*—(THE SPOTTED-BILLED DUCK.)

One out of a small party of four, undoubtedly of this species, was obtained at Ayon on 6th February. I very much regret not having sent down the skin as its occurrence so far into the mountains is interesting ; future observers might keep a look-out for it in summer on the Shandur Lake, where I believe a great many ducks and other water birds breed.

(1597) *Nettium crecca*—(THE COMMON TEAL.)

Passing south in fair numbers at the end of October, probably earlier. Passing north in larger numbers during March and April. A few stay for the winter.

(1599) *Mareca penelope*—(THE WIGEON.)

Passes north during March and early April.

(1600) *Dafila acuta*—(THE PINTAIL.)

Passes north during end of February and April.

(1601) *Querquedula circia*—(THE GARGANEY OR BLUE-WINGED TEAL.)

Passes north during April and beginning of May.

(1602) *Spatula clypeata*—(THE SHOVELLER.)

No skin. Observed in April.

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(1592) *Anas boscas*—(THE MALLARD.)

Pass southwards end of October, perhaps earlier, pass northwards during March.

* (1593) *Anas pœcilorhyncha*—(THE SPOTTED-BILLED DUCK.)

One out of a small party of four, [illegible] of this species, was obtained at Ayun on 6th February. I [illegible] not having sent down the skin as [illegible] interesting; future observers might [illegible] on the Shandur Lake, where I believe a [illegible] breed.

(1597) [illegible]—(THE [illegible].)

Passing south in [illegible] end of October, probably earlier. Passing north in larger [illegible] March and April. A few stay for the winter.

(1600) [illegible]—(THE [illegible].)

Passes north during March and early April.

(1600) [illegible]—(THE [illegible].)

Passes north during end of February and April.

* (1601) *Querquedula circia*—(THE GARGANEY OR BLUE-WINGED TEAL.)

Passes north during April and beginning of May.

(1602) *Spatula clypeata*—(THE SHOVELLER.)

No skin. Observed in April.

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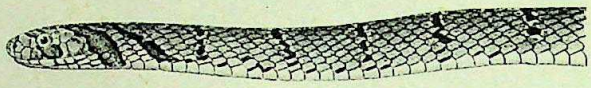
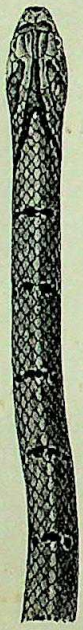
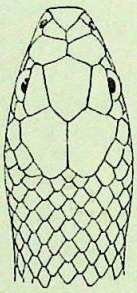
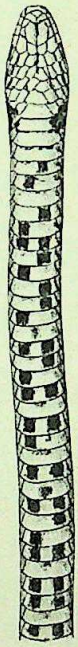
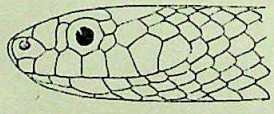
Journ. Bombay Nat. Hist. Soc.

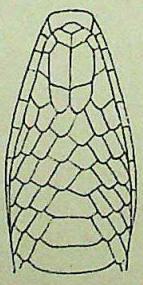












J. Green del. et lith.

NEW SNAKE FROM ASSAM.

Oligodon cyclurhachis.

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# A NEW SNAKE FROM ASSAM.

## *OLIGODON ERYTHRORHACHIS.*

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

(*With a Plate.*)

Among other snakes sent to me from Namsang, Jaipur, Assam, by Mr. C. Gore, I find one belonging to the genus *Oligodon*, which has not been previously described. It is a ♀ ?, measuring 1 foot $2\frac{3}{4}$ inches, of which the tail accounts for $2\frac{3}{4}$ inches.

*Lepidosis.*—*Rostral* touches 6 shields, the rostro-nasal and rostro-internasal sutures subequal, and nearly twice the rostro-labials. *Internasals* a pair, the suture between them nearly equal to that between the præfrontal fellows, less than half the internaso-præfrontals. *Præfrontals* a pair, the suture between them less than half the præfronto-frontals; in contact with internasal, nasal, 2nd labial, præocular, supraocular and frontal. *Frontal* touches 6 shields, the supraocular sutures rather longest. *Supraoculars* length about four-fifths, breadth less than half that of frontal. *Parietals* touch one postocular. *Nasals* undivided, in contact with the 1st and 2nd labials. *Loreal* absent, (perhaps confluent with the præfrontal). *Præocular* one. *Postoculars* two. *Temporal* one, touching the 5th and 6th labials. *Supralabials* 7; the 3rd and 4th touching the eye. *Infralabials* 4, the 4th largest, and in contact with two scales behind. *Sublinguals* two pairs, the posterior about $\frac{2}{3}$rds the length of the anterior, and in contact with the 4th only of the infralabial series. *Costals* two head-lengths behind the head 15, midbody 15, two head-lengths before the anus 13. In the reduction from 15 to 13, the 3rd and 4th rows above the ventrals unite. Vertebrals not enlarged. Ultimate row barely enlarged. No keels. No apical pits. *Ventrals* 154, not angulate. *Anal* divided. *Subcaudals* 46 pairs.

*Colour.*—The dorsal ground colour is dark grey, but when looked at closely, this effect is produced by a very fine powdering of black specks on a light grey ground. A bright red vertebral band passes from the nape to the tail tip, involving the vertebral, and one and a half rows on each side. Narrow, black, light-edged cross-bars pass over the back, 29 on the body, 7 on the tail, and become more or less

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broken up in the flanks. The dorsal ground colour extends well on to the sides of the ventrals. The head is marked with a dark band over the prærrontals which re-appear below the eye, oblique streaks from the parietals, behind the gape to the side of the neck, and an elongate, sagittiform mark on the nape, the apex of which meets the præfrontal band. The belly is whitish and handsomely adorned with squarish black spots, for the most part laterally disposed. A median red stripe passes along the belly and beneath the tail, disappearing anteriorly before the throat.

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# HISTORY OF THE SEA COCOA-NUT (*LODOICEA SECHELLARUM*, Labill.).

BY

E. Blatter, S. J.

There is scarcely any other palm which has been so little known and was yet the most celebrated formerly as the Sea Cocoa-nut or Double Cocoa-nut[1]. The French call it Coco de mer, Coco de Salomon, and Coco des Maldives, and it was known to the writers of the 16th and 17th centuries under the names of Nux Medica and Cocos Maldivicus. Before the exploration of the Seychelles in 1743, by order of Mahé de la Bourdonnais, then Governor of Mauritius, the nuts were only known from having been found floating on the surface of the Indian Ocean, and near the Maldive Islands. whence their French name was derived, and even in the time of Rumphius[2] the nut was spoken of as the "mirum miraculum naturæ, quod princeps est omnium marinarum rerum, quæ raræ habentur".[3]

The first European who described this famous fruit was the Portuguese Garcia d'Orta (Garcia ab Horto)[4]. He was physician to the Viceroy at Goa for about 30 years. In this capacity he found leisure for private study which he spent in the exploration and description of the useful plants and drugs of the country. In 1563 he published the results of his investigations in his "Coloquios da India",[5] which were soon translated into several modern languages, and into Latin by

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[1] Other names for the same nut are: Narajile-bahri (Arab. Pers.); Jahari-narial (Bomb.); Peule-on-si (Burm.); Darya-ka-narel (Guz., Hind. Duk.); Mudu-pal (Sing.); Katal-tenna (Malay.); Kaddet-taynga (Tam.); Samudrapu-tenkaya (Tel.); Coco das Maldivas, Coco do mar (Portug.) Meercocos, Seecocos, Doppelte Cocosnuss, Wundernuss Salomon's, Maldivische Nuss (Germ).

Rumphius (Rumpf George Eberhard) was born at Hanau in 1627 and died in 1702. He is called the "Plinius indicus", because he described and figured a great number of plants whilst stationed in Amboina. His manuscripts and drawings have been published in 6 volumes under the title "Herbarium amboinense", Amsterdam. 1741-1755.

Cf. Curtis, Bot. Mag., Vol. I. (new series) 2734—38, (1827).

[4] Cf. D. G. Dalgado, Classificaçao Botanica das Plantas e Drogas descriptas nos "Coloquios da India" de Garcia d'Orta, Bombaim, 1894.

[5] Garcia d'Orta, Coloquios da India, Goa, 1563.

The latest Portuguese edition was published in Lisbon in 1872.

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Clusius[1] in the year 1567. This work went through many editions, and it is in the one of 1605 that we read the following account of the "Coccus de Maldiva". [2] "This nut, and especially the kernel, are recommended by the inhabitants of those Islands (Maldive Islands) as a remedy against poison. I have been told by many trustworthy people that it proved useful in colic, paralysis, epilepsy, and other nervous diseases, and that the sick become immune against other diseases, if they drink water that has been kept in the shell for some time, and to which has been added a piece of the kernel. But as I have no personal experience I am not inclined to believe in these things. I had no time to make experiments and I prefer to use medicaments whose virtues are known to me and shown by experience, as, *e.g.*, the bezoar stone, theriac, and many other medicines, than new ones which are less reliable, because I do not know whether I have to adscribe to imagination only what people say about the beneficent effects of that nut. If, however, in the course of time, some facts will be verified, I shall not feel ashamed to change my opinion. The skin of the nut is black and smoother than that of the common Cocoa-nut, mostly ovate and not quite as round as the common nut. The kernel or inner pulp is hard and white when dry, sometimes slightly pallescent, full of cracks and very porous. The dose of the kernel is about 10 grains, taken in wine or water, according to the nature of the disease. The nuts are sometimes very large, sometimes small but they are always found thrown upon the shore. There is, besides, the common

[1] Clusius, Carolus (De le Cluse, Charles) was born at Antwerp in 1526 and died in 1609 His works are very numerous, for he not only published original descriptions of new plants, but he translated into Latin works from the French, Spanish, and Portuguese, thus rendering a most important service in the diffusion of a knowledge of the plants that were known in his day. Few men have suffered more in following a favourite pursuit than Clusius. He has on this account been called "The Martyr of Botany". As early as his twenty-fourth year, by excessive fatigue he contracted a dropsical disease. At the age of thirty-nine he broke his right thigh during one of his botanical rambles, and a short time after his right arm. Whilst at Vienna, he dislocated his left ankle, and eight years after this accident he dislocated his right hip. For this he was treated unskilfully, and ever after he was obliged to use crutches for support. During his exertions in the early part of his life he also contracted a hernia, which troubled him to the end of his days. But his bodily infirmities never diminished his mental activity, and he continued teaching and writing to the very last.

[2] "Aromatum et Simplicium aliquot medicamentorum apud Indos nascentium Historia conscripta a D. Garcia ab Horto, Proregis Indiæ Medico" in "Caroli Clusii Atrebatis Exoticorum Libri Decem", pp. 190-192 (1605).

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opinion that the Maldive Islands formed once part of a continent[1] which by an inundation of the sea disappeared, those islands alone being left; the palms, however, that produced those nuts, were buried underground and the nuts themselves became petrified in the way we find them now. Whether those palms belong to the same genus as our nut is difficult to say, as nobody up to now was able to see either the leaves or the stem of that plant. Only the nuts are washed ashore, sometimes in pairs, sometimes single; but nobody is allowed to collect them on penalty of death, because everything that is carried ashore belongs to the king. This circumstance has added a good deal to the value of these nuts. The pulp or medulla is then removed and dried in the same manner as our "Copra," till it becomes hard like the one you see in the market. In this condition you might easily mistake it for cheese." To this account Clusius adds the following note: "I have seen vessels made of this nut in Lisbon as well as in other places; they are usually more oblong and darker than those made of the common Cocoa-nut. You can even find the dried medulla of the nut in the market of Lisbon; its virtues are highly praised and it is preferred to almost all other alexipharmics. For this reason it is sold very dear. But you can easily gather from our author, how little faith such fabulous virtues deserve."

Whilst Garcia d'Orta was staying at Goa, a Spaniard, Cristobal da Costa (Christophorus a Costa), of the medical profession, left his home with the only desire to "observe and study the various plants which God had created for the benefit of man in the different countries and provinces." On his tour he came to Goa where he met his colleague Garcia d'Orta. From the personal intercourse with him as well as from d'Orta's book he received most of the information which sometime after was published in Spanish and translated into Latin by Clusius[2] in the year 1572. Regarding the Sea Cocoa-nut we read in

[1] That India and the southern and central parts of Africa were united in Mesozoic times into one great stretch of nearly continuous dry land is now proved by overwhelming evidence, taken from the Jurassic fossils as well as from the Cretaceous deposits. The great revolutions in physical geography, which took place towards the end of the Cretaceous and during early Tertiary times, resulted in the break-up of the old continent, and were followed by the rise of the Himalayan range. It would be highly interesting to trace the origin of the opinion expressed by Garcia d'Orta. Is it not possible that within historic times those islands were shaped into their present form?

[2] "Aromatum et medicamentorum in Orientali India nascentium historia, plurimum lucis adferens iis quæ a Doctore Garcia de Orta in hoc genere scripta sunt auctore Christophoro a Costa, Medico et Cheirurgo" in "Caroli Clusii Exoticorum Libri Decem." (1605.)



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his book: "The 'Coccus de Malediva' is in such high esteem with the natives of that Island and with the people of Malabar, not only with the lower classes but also with kings and princes, that in all sickness they confide in that fruit as in a sacred anchor. They make of it drinking cups in which there is a piece of the kernel hanging from a small chain and they are strongly convinced that whosoever has drunk water from such a cup, is immune against every poison and disease. I saw, however, a good many that drank from those cups and fell sick nevertheless. In spite of my careful observations I never noticed that anybody was cured by such a drink. Some even assured me that after a draught from such a cup the spleen and kidneys got inflamed. The price of these nuts is, nevertheless, very great, a single nut without any ornaments being sold for 50 and more gold pieces."

The fame of the Sea Cocoa-nut was so great in the 16th century that it found a place in Camoens' famous epic (X 136).

"Nas ilhas da Maldiva nace a pranta
No profundo das aguas soberana
Cujo pomo contra o veneno urgente
He tido por antidoto excellente."

"O'er lone Maldivia's islets grows the plant,
Beneath profoundest seas, of sovereign might,
Whose pome of ev'ry Theriack is confest
By cunning leech of antidotes the best." (Burton).

Another account of the Sea Cocoa-nut and a description of the Maldive Islands we find in the "Itinerario" of John Huyghen Van Linschoten (1596), who had spent five years (1584-89) in Goa and had seen a great part of Eastern Asia. The following quotation is taken from the edition of the "Hakluyt Society" [1]: "Right over against the Cape of Comoriin, 60 miles into the sea westward, the Ilands called Maldyva doe begin, and from this cape on the north syde they lie under 7 degrées, and so reach south south-east, till they come under 3 degrées on the south syde, which is 140 myles. Some say there are 11,000 islands, but it is not certainely

[1] The Voyage of John Hughen Van Linschoten to the East Indies. From the old English translation of 1598. The First Book containing his description of the East in two volumes. Vol. I. 74-76. London 1885.
Linschoten was born at Haarlem (Holland) about the year 1563 and died on the 8th February 1611.

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knowne, they can not be numbred. The Inhabitants are like the Malabares: some of these Ilands are inhabited, and some not inhabited, for they are very lowe, like the countrie of Cochin, Cranganor, etc., and some of them are so lowe, that they are commonlie covered with the sea: the Malabares say, that those Ilands in time past did ioyne fast unto the firme land of Malabar, and that the Sea in processe of tyme hath eaten them away. There is no merchandize to be had in them, but only coquen, which are Indian nuttes and cayro, which are the shelles of the same nuts, and that is the Indian hemp, wherof they make ropes, cables, and other such like. . . . . There are some of these nuttes in the said Iland that are more estéemed then all the nuttes in India, for that they are good against all poyson, which are verie faire and great, and blackish: I saw some that were presented unto the viceroy of India, as great as a vessell of 2 cānes measure, and cost above 300 Pardawen, which were to send unto the King of Spaine. Of this trée and her fruites, together with the usage thereof I will discourse more at large in the declaring of the Indian trées and fruites."

We are looking in vain for a more detailed description of the fruit in the II volume of the Itinerario, where a great number of plants are described[1].

The best account of the Maldives is that by François Pyrard[2] who was shipwrecked there in 1601. His description contains also the following short note on the Double Cocoa-nut: "The king has, besides his revenues, certain rights, *e.g.*, everything that is found on the seashore belongs to the king, and nobody has the courage to touch anything of the kind in order to keep it, but all must bring what they find to the king, whether it be a piece of a wrecked ship, pieces of wood, a box or other things carried to the shore. The same obtains

[1] Gulielmus Piso was so much disappointed at not finding the description promised by Linschoten that he wrote: "Promittens Nucis medicæ arborem integra historia enarrare, in quo tamen velut corvos hiantes nos eludit, vulgarem vero pertractare decurrit subsidiis in hanc mentem non excussus." Mantissa Aromatica in Clusius, l. c. p. 215.

[2] Pyrard was born at Laval towards 1575, travelled in the East Indies, was shipwrecked near the Maldives, fell into the hands of a Prince in Bengal, served two years in the Portuguese Army, and published on his return to France his "Discours du voyage des Français aux Indes Orientales," Paris, 1611. A better edition by Bignon and Bergeron appeared in 1615 under the title: "Voyages des Français aux Indes Orientales, Maldives, Moluques, et au Brasil, de 1601 à 1611.—We quote from the edition of 1679, Paris.

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with regard to a certain nut which is sometimes washed ashore. It has the size of a man's head and can be compared with two large melons grown together. People call it Tavarcarre and they believe that it comes from a tree growing at the bottom of the sea. The Portuguese call it 'Cocos des Maldives'. It has medicinal properties and carries a high prize. Very often, on account of this Tavarcarre, the servants and officers of the king maltreat a poor man if he is suspected of having found such a nut; if somebody wants to take revenge on his neighbour he accuses him of having a nut in his possession, in order that his house may be searched, and if somebody becomes rich on a sudden and within a short time, people begin to say that he found a Tavarcarre, as if this were a great treasure."

More credulous than Clusius and D'Orta as regards the wonderful properties of the Sea Cocoa-nut is William Piso, a Dutch physician, who had travelled in Brasil between 1636 and 1641, and who, by his writings added considerably to the scientific knowledge of the West Indies. He devotes a whole chapter written in elegant Latin to the "Nux Medica Maldivensium,"[1]. He first of all excuses himself, because he gives the figure of the fruit only instead of the whole plant; but nobody, he says, can expect the illustration of a plant which has been devoured by the sea and is now growing at a depth of 16 fathoms. The introduction to the chapter gives a vivid idea of the high esteem in which the Sea Cocoa-nut was held in former centuries, and, at the same time, of the way in which scientific subjects were treated 300 years ago. It runs as follows: "Amongst the immense benefits which the Divine Providence has showered upon mankind during the last centuries, one of the most valuable is the discovery of so many medicaments destined for the protection of the human race, because, after the welfare of the soul, the health of the human body takes the first place. With regard to the invention of iron machines, of which our present age is boasting so much, I should rather say that they are for the ruin of the nations than for their welfare. Also the art of printing, though it may be specially fit for the preservation of literary monuments, only favours the bad zeal (kakozelia) of unable scribblers. Similarly, there is no reason why we should be proud of the booty of

[1] Gulielmi Pisonis Mantissa Aromatica sive de Aromatum cardinalibus quatuor, et Plantis aliquot Indicis in Medicinam receptis, relatio nova. Caput XIX.

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the Aerythraean Sea or of the gold mines of the Atlantis, because, according to the highminded poet the yellow metal is more dangerous than the iron.

Jamque nocens ferrum, ferroque nocentius aurum
Prodierat; prodit bellum, quod pugnat utroque.
(Ovidius Metamorphosios primo.)

But the glory of the European Argonauts can never be too loudly sung; they have discovered a new continent which was hidden for centuries, they have unveiled the secrets of the sea and shown the way to so many islands scattered in the Indian Ocean. By their efforts it came about that almost

——Omnis ferat omnia tellus,

and that foreign medicaments of high and rare value were introduced into our country. Amongst them the Sea Cocoa-nut (Nux Medica Maldivensis) occupies the first and foremost rank, whether we consider its rareness or its prize and value, or finally its usefulness that was ever praised."

As to the origin of the nut Piso gives two opinions The common people say that it grows on trees that are hidden in the sea, or which were covered with water at the time of an inundation, or that had their roots in the water as their natural medium. The more devout hold a different view. They believe that the nut grows on an island called Pallays, which is invisible to those who want to find it, and visible to others that do not know about it. From that island the nuts are carried away by the ocean-currents and washed upon the shores of the Maldives. The inhabitants of the Maldive Islands believe that Pallays is the happiest of all the countries of the world, and that the devils and malicious genii want to hide it before the eyes of man.

Piso relates that Rudolf II, Emperor of Germany, offered 4,000 florins for a Sea Cocoa-nut, but the family Wolfered in whose possession the nut was, was not inclined to part with it. In the Maldivian Islands the value of one nut was estimated at from 60-120 crowns; but those which measured as much in breadth as in length were the most esteemed; and those which attained a foot in diameter, were sold for 150 crowns; some kings have even been so greedy of obtaining these fruits as to have given a loaded ship for a single one.

We can easily understand the great desire of many of becoming the happy owner of such a nut, if we read the long catalogue of cases

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drawn up by Piso, in which the Nux Medica is said to have played such an important part in the restoration of the diseased to their former health. We cannot refrain from reproducing in this place for the benefit of the "sons of Æsculapius" at least two of the many medical prescriptions which were believed in and followed in the 16th and 17th centuries:

In Peste et Febribus malignis Contagiosis.

Cocci Maldivensis ʒj. Seminis Acetosæ mundati ℈j. Syrupi e succo Granatorum acidorum. aut Scabiosæ. aut florum Tunicæ ℥j. Diascordii Fracastorii ʒj. Decocti radicum Petasitidis, Scordii et Scorzoneræ. aut aquarum Boraginis, Buglossæ, q. s. F. Potio.

In Dysenteria cruenta, et Torminibus: facta ante praeparatione debita per Rheum et Clysteres.

Corticis intermedii Nucis Medicæ ʒj (si desit, Medulla aut Putamen vicem suppleat). Terræ Lemniæ, Lapidis Bezoartici Orientalis et Bistortæ radicis ana ʒj. Syr. de succo Portulacæ parum, ad consistentiam, Bol. F et insuper adjectis requisitis, Conditum, Potio, et similia.

The most complete historical account of the Sea Cocoa-nut we find in Rumphius (Herbarium Amboinense, VI, 210) who describes the marvellous fruit under the Dutch name "Calappa Laut." The stories are fabulous enough, but in addition to it he tells us, that many other tales were related to him respecting it, too absurd to be repeated. The Malay and Chinese sailors used to affirm that it was born upon a tree deep under water, which was similar to the Cocoa-nut tree. and was visible in placid bays, upon the coast of Sumatra, but that if they sought to dive after the tree, it instantly disappeared. The Negro priests declared it grew near the island of Java, where its leaves and branches rose above the water, and in which a monstrous bird, or griffin, had its habitation, whence it used to sally forth nightly, and tear to pieces elephants, tigers, and rhinoceroces with its beak. the flesh of which it carried to its nest. Furthermore they avouched that ships were attracted by the waves which surrounded this tree, and there retained, the mariners falling a prey to this savage bird, so that the inhabitants of the Indian Archipelago always carefully avoided that spot. Rumphius thinks that the Chinese as well as the natives of the Archipelago have set, perhaps too high a value upon the medical properties of the nut, considering it an antidote to all poisons. The principal virtue

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resided in the meat or albumen, which lines the nut, and which is so hard and corneous, as to be preserved for a length of time after the embryo is destroyed. This substance was triturated with water in vessels of porphyry, and, mingled with black and white, or red coral, ebony, and stags' horns, was all drunk together. The great men formed of the shell, which possesses fewer medicinal properties precious vessels, cutting off a transverse slice, which constitutes the lid; in this they put their tobacco, betel, lime, and whatever else they masticate, believing they can never then be contaminated by anything noxious.[1]

With the discovery of the Seychelles in 1743, a new period began for the Sea Cocoa-nut, the object of so many legends and superstitions. La Bourdonnais[2] was the first to discover the tree on one of the Seychelles Islands. He called it "Isle of Palms" now known by the name of "Praslin" Later on the tree was also found on Curieuse and Round Island. These are within half a mile of each other mountainous and rocky. Plant, the well known explorer of Port Natal, tells us in what surroundings this noble palm is growing: In the Seychelles," he says, "I more nearly realized my preconceived ideas of tropical vegetation than at any other place;—the beach fringed with common Cocoa-nuts; the ravines and watercourses overhung with Bananas Bamboos, the open ground full of Pineapples—mi es of them run wild; the tops of the mountains covered with forests of Ebony and Rosewood interspersed with Tree-ferns of some 20-30 feet high, and then these glorious Lodoiceæ, with their leaves of fifteen to twenty feet span, and trunks reaching to the sky; to say nothing of groves of Cinnamon and Cloves and Bread-fruit, all new to me in this their natural wildness and beauty" Harrison is not less enthusiastic when he remarks: "To behold these trees growing in thousands, close to each other, the sexes intermingled; a numerous offspring starting up on all sides, sheltered by the parent plants;—the old ones fallen into the sear and yellow leaf, and going fast to decay, to make room for the young trees, presents to the eye a picture so mild and pleasing that it is difficult not to look upon them as animated subjects, capable of enjoyment, and sensible of their condition."

1 G. Curtis, Botanical Magazine, 2734-88.

2 Mahé de la Bourdonnais, born in 1699, died in 1753.

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Although the tree had been discovered at last, it still took a long time before it was accurately described. Pierre Sonnerat[1] gave a description of it, though not a very scientific one, when on his tour to New Guinea he landed upon the Isle des Palmiers (Praslin). He was the first to introduce the tree into the Isle of France.

The description given by Rochon[2] does not add any new information. It is, however, interesting to hear, that it was not uncommon as late as 1759 to see the nuts sold for upwards of four hundred pounds sterling each.

After this several botanists described the palm under different names: Gmelin called it Cocos maldivica[3], Giseke, Borassus sonnerati[4], Commerson Lodoicea Callipyge and Cocos maritima[5]. Persoon, Lodoicea maldivica[6]. At last La Billardière was able to give a botanical description of it under its present name Lodoicea sechellarum[7], to which he added figures from specimens preserved in spirits, together with a representation of the tree from a drawing made in the Seychelles Islands by M. Lilet. The description is followed by an account of the uses of the Palm, communicated to the Museum of Natural History at Paris by M. Quéau-Quincy, Correspondant et Administrateur Général des Isles Seychelles. The description, however, was still deficient in many points, and it was to be expected that a botanist like W. J. Hooker could find no rest before he had found out everything about that interesting tree. "These accounts [of La Billardière]" he writes in 1827 "in conjunction with some nuts that Mr. Barclay and myself received from our inestimable friend and correspondent, Charles Telfair, Esq. of the Mauritius, only served to stimulate our curiosity; and we requested Mr. Telfair, to procure, if possible, either from the Palms that he informed us were cultivated in the Isle of France, or from

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[1] P. Sonnerat, Voyage à la Nouv. Guinée, Paris 1776, I. p. 3-10, t. 3-7. Sonnerat born towards 1745, died in 814, spent the greatest part of his life in travels and scientific observations.

[2] A. M. Rochon, Voyage à Madgascar, II. 146.

*Cf.* also Bory de Saint-Vincent, Voyage dans les îles d' Afrique, III. 156,246.

[3] Gmelin, J. F. Systema Naturæ. II., p. 569.

*Cf.* also Willdenow, Species Plantarum IV. p. 402, n. 6.

[4] Giseke, Lin. Prael. Ord. nat., p. 86

[5] Commerson Ms II and Palmarium Vol. t. 1-15.

[6] Persoon, C. H. Enchir II., p 630.

[7] La Billardière in Annales du Mus. d' Hist. Nat. IX. p. 140, t. 13.

*Cf.* also Sprengel, Systema Vegetabilium II., p. 622.

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the Seychelles Islands, such specimens as would enable us to publish more satisfactory delineations than had yet appeared. The Isle of France Palms had not yet fructified; but Mr. Telfair lost no time in begging his friend J. Harrison, Esq., of the Seychelles, to obtain the necessary specimens. With the utmost promptitude and kindness that gentleman devoted several days to visiting, with a dozen of blacks, the Isles of Praslin and Curieuse; and in the midst of those little known islands, he not only made drawings from the living trees, but procured and forwarded to us, through Mr. Telfair, the male and female spadices and fruit, in different states, preserved in spirits, with leaves, a seedling plant, and even a portion of the trunk. All these, except the fully ripened fruit, arrived in safety. A perfect representation, therefore, of the mature nut, is still wanting"

This want has been supplied, in the meantime, by various botanists, and the once so mysterious Sea Cocoa-nut tree is as well known as any other palm. We are not going to give a detailed description of the tree, as we are only concerned with its history, but we must mention a few points of interest regarding its life-history and economic uses.

This magnificent palm requires a great length of time to arrive at maturity. The shortest period before it puts forth its flower-buds is 30 years, and 130 years elapse before it attains its full growth. From the age of 15-25 years it is in its greatest beauty, the leaves at this period being much larger than they are later on. The stem grows quite upright, straight as an iron pillar, and in the male trees frequently attains a hundred feet in height, the females being shorter. At the age of 30 it first puts forth its blossoms, the males forming enormous catkins about 3 feet in length, and 3 inches in diameter, while the females are set on a strong zigzag stalk, from which hang four or five, or sometimes as many as eleven nuts, averaging about 40 lbs. weight each. From the time of flowering to the maturation of the fruit, a period of nearly 10 years elapses, the full size, however, being attained in about 4 years, at which time it is soft and full of a semi-transparent jelly-like substance. The arrangements provided by nature for the roots of this tree, are of a most peculiar kind. The base of the stem is rounded, and fits into a natural bowl or socket about $2\frac{1}{2}$ feet in diameter and 18 inches in depth. This bowl is pierced with hundreds of small oval holes about the size of a thimble, with hollow tubes corresponding on the outside, through which the roots penetrate the



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ground on all sides, never however becoming attached to the bowl, their partial elasticity affording an almost imperceptible but very necessary "play" to the parent stem when struggling against the force of violent gales. This bowl is of the same substance as the shell of the nut, only much thicker; it rots very slowly, for it has been found quite perfect and entire in every respect 60 years after the tree has been cut down.

The crown of the trunk, *i.e.*, the heart of the leaves is eaten like that of the American Cabbage Palm (Oreodoxa regia), and often preserved in vinegar; but it is less delicate and slightly bitter The trunk itself after being split and cleared of its soft and fibrous part within, serves to make water troughs, as well as palisades for surrounding houses and gardens. The foliage is employed to thatch the roofs of houses and sheds, and even for the walls. With a hundred leaves a commodious dwelling may be constructed, including even the partitions of the apartments, the doors and windows. The down which is attached to the young leaves serves for filling mattrasses and pillows. Of the ribs of the leaves and fibres of the petiole they make baskets and brooms. The young foliage affords an excellent material for hats: for this purpose, the unexpanded leaves only are taken, dried in the sun, and cut into longitudinal strips, 2 or 3 lines in breadth, which are then plaited. Of the nut are made vessels of different forms and uses. When preserved whole and perforated in one or two places the shell serves to carry water. Plates, dishes, and drinking cups made of the nuts are valuable from their great strength and durability, so that this kind of utensil, in the Seychelles Islands, bears the name of "Vaiselle de l'Isle Praslin." Amongst other articles, shaving dishes, black, beautifully polished, set in silver and carved, are made from them.[1]

The marvellous medicinal properties which were ascribed to the nuts by ancient physicians, both European and Asiatic, have been recognized as fanciful nowadays and dependent solely on the rarity of the fruit. It is consequently no longer valued by Europeans but it is (according to Dymock) still in great repute among the Arabs and natives of India as a tonic, preservative, and alexipharmic. Ainslie relates that in his time the Vytians occasionally prescribed the kernel given in woman's milk, in cases of typhus fever, the dose being 'a quarter of a pagoda weight twice daily," and adds, 'it is also reputed antiscorbutic

[1] *Cf* Hooker, l c.

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and antivenereal." Dymock mentions that in Bombay it is prescribed as a tonic and febrifuge in combination with Lignum colubrinum (the small branches of Strychnos colubrina, L.). It is also believed to possess several other properties. "Daryali-naryal" says S. A. Ravat, "is corrupted in Bombay into Jehari-naryal which means 'poisonous Cocoa-nut,' and it is believed to be so by the common people. It is, however, non-poisonous, and is commonly given to children, mixed with the root of Nux vomica, for colic. It seems to act mechanically, like Bismuth." Rubbed up with water, it is given by natives to check diarrhœa and vomiting, especially in cholera. Some believe that the water of the green fruit or its soft kernel is antibilious and antacid when taken after meals.[1]

It is to be regretted that the tree is not cultivated, and that a practice has prevailed of cutting it down in order to get at the fruit and tender leaves, and it is to be feared that this will lead to the extinction of the Sea Cocoa-nut, which will become in reality as rare as it was supposed to be by the travellers who picked up the first known specimens of its nuts floating on the sea.

[1] *Cf.* Watt. Dict. of Econ. Prod. of India, Vol. V. 88.

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# A FIRST LIST OF MOSSES FROM WESTERN INDIA.

BY

L. J. SEDGWICK, I.C.S.

During the last two years the writer has been sending to England packets of specimens, which have in every case been indentified by Mr. H. N. Dixon, F.L.S., the well known English Bryologist. Where necessary the latter has consulted various continental authorities, especially Dr. Brotherus, and M. Cardot, and with the first two has named some new species. There still remain some undetermined, and apparently new, species sent from Mahableshwar in February last, but they will be included, it is hoped, in a later list in this journal. Besides the specimens collected by the writer there are four gathered by Mr. R. M. Maxwell, I.C.S., in Kanara, a number of specimens gathered by Lt.-Col. K. R. Kirtikar, F.L.S., I.M.S. (retd.), at various times during the last few years, and sent to the writer, and a few gathered by Prof. Woodrow about 1895, and sent by Col. Kirtikar with his own.

Very little can be done in the way of identifying Indian mosses in this country owing to the absence of literature, or type collections. The only works dealing with Indian Bryology are (1) Mitten's Musci Indiæ Orientalis, written in Latin and published by the Linnean Society in 1859, (2) Thwaites and Mitten's Mosses of Ceylon, (3) Contributions to the Bryological Flora of the N.-W. Himalayas by V. F. Brotherus, in the Acta Societatis Scientiarum Fenica, Helsingfors, 1898, (4) Contributions to the Bryological Flora of S. India by the same author, in Records of the Bot. Survey of India, Vol. I., No. 12, Calcutta, 1899. The first two are quite out of date, but the last two might prove of considerable use. The mosses from S. India described by Brotherus were collected by Dr. Walker in Coorg and Ceylon, and as Mr. Dixon says (in an article on the earlier gatherings of the present writer in the J. of B. for May), the mosses sent so far "naturally exhibit a close relationship with these (*i.e.*, the Coorg mosses) as well as with those of the Nilgiri Hills, and also, like them, indicate a very promising bryological field of study." Those sent by Col. Kirtikar as well as those representing the earlier collection of Prof. Woodrow are mainly duplicates of specimens collected by the writer,

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but the Kanara flora gives promise of an entirely different type. This is no doubt due to the fact that in that district both the mountains and the jungle approach much closer to the coast so that the influence of sea breezes is combined with the high altitudes and heavy rainfall of the whole mountain system of the Western Ghats.

The thanks of the present writer are due to Mr. Dixon, and also to Mr. G. B. Savery of Exeter, without whose assistance no headway could have been made with the study of these most facinating plants.

In the list below the new species are marked with* and those the fruit of which was new with†

*Pogonatum aloides*, P. Beauv.

c. fr., Mahableswar, on banks, Wood., Sedg.

This is the large oriental form mentioned in Dr. Braithwaite's British Moss Flora.

*Campylopus aureus*, v. d. B. & Lac.

Sterile, on the ground, Mahableshwar, Wood., Sedg.

*Octoblepharum albidum*, Hedw.

c. fr., Ratnagiri, Wood. Matheran, Kirt. On a toddy palm, Khairne, Thana District, Sedg.

† *Fissidens splachnobryoides*, Broth.

Sterile, Thana, Sedg. c. fr. on stones at Trimbakeshwar, Nasik District, Sedg.

The fruit was previouly unknown, and was described from the Trimbak specimen by Mr. Dixon in J. of B., Vol. 47, May 1909.

*Fissidens* (*Semilimbidium*) *Walkeri*, Broth.

On an earth bank in the Krishna R., Walva, Satara District, c. fr. Sedg. On an earth bank in a torrent course, Waishakhare, Thana District, Sedg.

In both these cases the bank on which the moss was growing is submerged in the rains, and it is probable that the moss will be found to be common in such places.

*Fissidens crenulatus*, Mitt.

c. fr., on earth banks, Mahableshwar, Sedg.

*Anœctangium Walkeri*, Broth.

On stones, Panchgani, sterile, Sedg.

*Hymenostomum edentulum* (Mitt.), Besch.

c. fr. on stones, Panchgani, Sedg.

*Hyophila cylindrica*, Hook.

Sterile and c. fr. (v. common) "Poona," Wood. Bandra, Lonavla, Mahableshwar, Kirt. Mahableshwar, Panchgani, Trimbakeshwar, Sedg.

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*Barbula consanguinea*, Thw. & Mitt.

Sterile, on tiles in the Ganeshkhind Botanical Gardens, Sedg.

*Calymperes Fordii*, Besch.

Sterile, on tree trunks, Andheri, Sedg.

*Pottia vernicosa*, Hampe.

c. fr. on a wall, Thana, Sedg.

*Macromitrium sulcatum*, Brid.

Sterile, Kanara, Max. "Poona", Wood. Matheran and Mahableshwar, Kirt. On trees, v. common, Mahableshwar and Panchgani, Sedg. Often c. fr.

*Trichostomum stenophyllum*, Mitt.

c. fr. on trees, Mahableshwar, Sedg.

*Splachnobryum indicum*, Hampe & C. M.

c. fr. on flower-pots, Thana, Sedg.

*Funaria hygrometrica*, Sibth.

c. fr. v. common, "Poona", Wood. Mahableshwar, Kirt. Lonavla, Mahableshwar, always on sunny walls, Sedg.

Some of the gatherings approach the forms which have been called *F. leptoda*, Griff, and *F. nepalense*, C. M., but these are probably inconstant and local variations from the type.

**Brachymenium Turgidum*, Broth.

(Dixon in Revue Bryologique 35e annee, 1908, No. 4, p. 94.)

c. fr. n. sp. type described from a gathering from timber of a small bridge, Lonavla. Also on branches of an Euphorbia, same place, and on trees, Lonavla and Trimbakeshwar, all Sedg.; also Lonavla and Matheran, Kirt.

*Brachymenium nepalense*, Hook.

c. fr. on walls, Lonavla, Sedg.

*Brachymenium walkeri*, Broth.

c. fr. on stones, Panchgani, Sedg.

*Anomobryum cymbifolium*, Broth.

(*Bryum filiforme*, Mitt.)

Sterile, on stones and trees, Mahableshwar, Panchgani, Lonavla, Trimbakeshwar, Sedg.

*Bryum coronatum*, Schwaeg.

c. fr. v. common, on walls, almost everywhere, Sedg. "Poona" (1895) Wood.

*Bryum strigosum*, Wils.

(*B. Wightii*, Mitt.)

Sterile, Mahableshwar, Wood., Kirt., Sedg.

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* *Bryum Ghatense*, Broth. & Dixon (not yet described).

c. fr. Lonavla, on a small bridge, and at Mahableshwar on a small bridge, Apparently always in sunny places and associated with *Funaria hygrometrica*.

A new species of the Areodyctyon group of Bryums, with lax rhomboidal cells, and stout wine-red nerves, and a small upright, club-shaped capsule.

*Philonotis revoluta*, v. d. B. & Lac.

Common, always sterile. Mahableshwar, Kirt. and Sedg. Lonavla, Panchgani and Trimbakeshwar, Sedg.

*Erpodium mangiferæ*, C. M.

Sterile. On the bark of a jackfruit tree, Ghatkopar, Sedg.

Mr. Dixon in a long note in the J. of B. loc. cit. expresses as his opinion based on a study of this specimen together with those of *E. mangiferæ* and *E. bellii*, Mitt., in Mitten's own herbarium, and at the British Museum, that the two specimens must be united.

* *Pteryobryopsis Maxwellii*, Cardot & Dixon.

n. sp. (Dixon in J. of B. loc. cit. p. 160).

On trees and rocks, Kanara, c. fr., Maxwell, after whom it is named. On trees, Mahableshwar, Sedg.

*Pterobryopsis Walkeri*, Broth.

On stones, Kanara, Maxwell. On trees, Mahableshwar, Sedg. Fruit unknown.

(First described as a new species sub nom. P. Kanarense by H. N. Dixon, loc. cit., p. 163, but now referred to *P. Walkeri*.)

*Trichostelium monostichum*, Thw. & Mitt.

c. fr., on tree roots, Mahableshwar, Sedg.

*Sympysodon anjustatus*, (C. M.) Jaeg.

c. fr., on trees, Mahableshwa , Sedg.

*Trachopodiopsis blanda*, (Mitt.) Fleisch.

On trees, common, "Poona" (1895), Wood. Matheran and Mahableshwar, Kirt. Lonavla, Trimbakeshwar, Mahableshwar, Sedg. Always c. fr.

*Meteoriopsis squarrosa*, (Hook.) Fleisch.

Sterile, on trees, Mahableshwar, Kirt. & Sedg.

*Levierella fabroniacea*, C. M

c. fr., on trees, Trimbakeshwar, Sedg.

*Stereophyllum tavoyense*, (Hook.) Jaeg.

c. fr., on a tree, Wasind, Thana District, Sedg.

† *Pinnatella calcuttensis*, (C. M.) Fleisch.

Sterile, Mahableshwar, Kirt. c. fr., Mahableshwar, Sedg. The fruit is new and has not yet been described. It does not fruit freely, and the fruit is

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brittle, the capsules being small for so large a moss, cup-shaped, of a fuscous colour, and produce from irregular positions on the branches on setas about 3 or 4 lines long, which grow at right angles to the pendulous branches.

*Neckera andamana*, C. M.

On trees, Kanara, Max.

It is hoped to bring out a second list in the course of a few months. The writer would be most grateful for specimens from any part of India. Mosses are no trouble to collect, as they do not require pressing, mounting, or preserving in any way, and it does not matter in what manner or position they are packed.

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# PLANTS OF THE PUNJAB.

## A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

BY

Lieut.-Colonel C. J. BAMBER, F.L.S.,

*Indian Medical Service.*

### PART V.

*(Continued from page 721 of this Volume.)*

SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

**Anona squamosa,**
*Custard Apple, Sharifa, Sitaphal.*
ANONACEÆ.
F. B. I. i. 78.
The Plains as far north as Gurdaspur (Watt)

large, nearly evergreen ; leaves 2-3 by ¾-1½ ins. oblong, blunt or long pointed, base narrowed, bluish green beneath, velvety when young, membranous, stalked ; flowers white, 1 in. long, solitary on short branchlets, sepals 3, small, triangular, united at the base, petals 3, outer 1 in. long, narrow-oblong, fleshy, inner 3 minute or wanting ; stamens many, style one; fruit 2-4 ins. across, yellowish green, fleshy, edible, covered with a yellowish green skin, tubercled like crocodile skin, seeds many, oblong, brownish black, with a swelling at the notch. A native of the West Indies cultivated for its fruit.

**Farsetia Jacquemontii,**
*Faridbuti, lathia.*
CRUCIFERÆ.
F. B. I. i. 140.
The Plains in sandy places, Sirsa.

small ; branches rigid, hoary, with hairs flattened to the twigs, twiggy ; leaves ¼-1 in., linear ; flowers large in spikes, sepals 4, hairy, pointed, pouched at the base, petals 4, half as long again as the sepals with long stalks, stamens 6 ; capsules 1½-2 ins. by ⅛-⅙ in. flattened, linear, sessile, valves flat, seeds nearly round, broadly winged, in two series.

**Farsetia Hamiltonii,**
*Faridbuti.*
CRUCIFERÆ.
F. B. I. i. 140.
The Plains.
Shahpur (Douie).

small, branches more rigid and woody and more densely velvety than the last species, long, erect and twiggy ; leaves linear, very narrow, flowers small in long spicate racemes, sepals 4, hairy, blunt, margins thin, papery, petals 4, ovate with a broad tip, a little longer than the sepals, long stalked, pink, stamens 6 ; capsules linear ½-1 by $\frac{1}{10}$ in., seeds as above but in one series.



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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

**Farsetia aegyptiaca,**
*Muli.*
CRUCIFERÆ.
F. B. I. i. 140.
Salt range (Edgeworth).
Choa Saidan Shah (Douie).

small, branches rigid, hoary, forked, twiggy; leaves linear; flowers in spikes, not close set, large, calyx cylindrical, sepals 4, blunt, ¼-⅓ in., hoary, petals 4, linear, blunt, twice as long as the sepals, stamens 6; capsules ½-¾ by ⅛-¼ in., broad, erect, seeds as above in two series.

**Diptorygium glaucum,**
CRUCIFERÆ.
F. B. I. i. 164.
The Plains.
Multan (Edgeworth).

small, branches many, widely separating; smooth or leaves and stem slightly rough with sticky glands; leaves ⅙-½ in. long, ovate oblong, shortly stalked; flowers small, few in bracteate racemes, sepals short, 4, petals 4, stamens 6, free, capsules ⅛ in., drooping, wrinkled transversely, seed solitary, winged.

**Physorhynchus brahvicus,**
CRUCIFERÆ.
F. B. I. i. 165.
Salt range (Vicary).

small, smooth, leafy; leaves fleshy, 1-4 ins., ovate oblong, lower stalked, upper linear-lanceolate, narrowed at the base, running down the stem slightly, with earshaped lobes, flowers large, white in long racemes, sepals 4, erect, petals 4, stamens 6; capsules two jointed ⅓-¾ in. long, lower joint seedless, upper large, ovoid, 2-celled, cells 2-4-seeded with long conical beak, seeds flattened.

**Xylosma longifolium,**

see Trees, Alternate, Exstipulate, Simple.

**Tamarix gallica, Tamarisk,**
*Jhav, pilchi, lai.*
TAMARISCINEÆ.
F. B. I. i. 248.
The Plains.
Delhi, Lahore.

large, branches slender jointed leaves minute, scale like not sheathing, overlapping at first, distant later, usually green; flowers ⅛ in. diam., shortly stalked, crowded in long slender spiked branched racemes, white or pink, bracts shorter than the flowers, half sheathing, membranous, short-pointed, sepals persistent, triangular, blunt; petals longer than the sepals, stamens 5, styles 3; capsules ¼ in. long, narrowed from an ovoid base.

**Tamarix salina,**
*Kwa.*
TAMARISCINEÆ.
F. B. I. i. 248.
North-Western Frontier Province.
Esakheyl.

medium size, smooth, bluish green; leaves minute, scale-like, heart shaped, somewhat sheathing, bracts equalling the flowers in length, linear, stigmas sessile, in other respects like the last species.

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

**Tamarix dioica,**
*Kac'lei, panch pilchi.*
TAMARISCINEÆ.
F. B I. i. 249.
The Plains.

small, branches long drooping; leaves minute, scale-like, sheathing, greyish green with a broad white margin, smooth, long-pointed; flowers in two sexes, purple pink in rather short compact stalked spikes, bracts nearly as long as the flowers, triangular, long pointed, reddish brown, stamens 10, styles 3; capsule oblong tapering, twice as long as the withered sepals and petals.

**Myricaria germanica,**
*Ghaz.*
TAMARISCINEÆ.
F. B. I i. 250.
Hazara, 7-8,000 ft.
(Barrett).

medium size, branches many, parallel to the stem, stem slender with fine parallel lines, with blueish green waxy gloss when young; leaves small, linear-lanceolate, flowers small, pink-purple, on short stalks in lateral or terminal spike-like racemes, 1-18 ins. long, bracts ovate-lanceolate, three to four times as long as the short flower stalks, with broad thin margins, sepals 5, ununited, lanceolate, equal in length to the petals, petals 5, stamens 10, alternately long and short, united for half their length, stigmas 3, sessile; seeds many, with a tuft of hairs, usually stalked.

**Skimmia laureola,**
*Ner, burru.*
RUTACEÆ.
F. B. I. i. 499.
Himalaya, 6-10,000 ft.
Simla, Mahasu (Collett).
Murree, Hazara (Barrett).

small, strongly aromatic, evergreen; bark white, stringy; leaves oblong lanceolate, 3-6 ins. long, smooth, gland-dotted, shining, crowded at the end of branches; flowers male and female ½ in. diam., white or yellow, in crowded erect terminal branching racemes 1½-2 ins. long, calyx persistent, 5-lobed, petals 4-5, oblong, much longer than the calyx, stamens 4-5, imperfect in female flowers, stigma 2-5 lobed; drupe red, ovoid ½-¾ in. long, with 2-5 one-seeded stones.

**Citrus medica,**
**Lemon or Lime,**
*Nimbu.*
RUTACEÆ.
F. B. I. i. 514.
The Plains.

large, bark greenish grey, smooth, long axillary spines; leaves jointed to stalk, stalk often winged, 3-6 ins. by 1-2½ ins., ovate lanceolate, smooth, leathery; flowers white, sweet-scented, solitary or in axillary clusters, ½-1 in. long, calyx cup-shaped, 3-5-toothed or entire, petals 4-8, often tinged with pink, oblong, fleshy, gland-dotted, stamens 20-40; fruit 2-4 ins. long, ovoid oblong or round, rind thick or thin, yellow when ripe, pulp cellular and juicy, usually acid.

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

**Olax nana,**
OLACINEÆ.
F. B. I. i. 576.
Himalaya to 5,000 ft.

small, dwarfed by jungle fires, root stock woody with annual ribbed shoots 2 ft. high ; leaves 1⅛-2⅔ by ¼-⅔ in., oblong-lanceolate, nearly sessile, smooth and light green above, greenish with a bloom beneath, margins turned back ; flowers nearly ½ in. across, solitary, calyx minute, increases in fruit, petals 3, oblong-lanceolate, stamens 3, staminodes 5-6, bifid, longer than the stamens ; fruit, the size of a pea, round, one-seeded.

**Gymnosporia or Celastrus, Royleana or spinosa,**
*Gwala darim.*
CELASTRINEÆ
F. B. I. i. 620.
Himalaya to 3,000 ft.
Salt range.
Hazara (Barrett).

medium size, smooth, densely branching, stiff, straight, axillary spines not bearing leaves ; leaves smooth, ovate or round, ¾-1½ ins. by ½-1 in., toothed ; flowers many, white in short axillary clusters, calyx five lobed, lobes obtuse, minutely fringed, petals 5, oblong, stamens 5 ; capsule three-angled, ¼ in. diam., cells three, seeds 3, half enclosed in a red fleshy outer coat.

**Gymnosporia Wallichiana or Celastrus rigida,**
*Pataki.*
CELASTRINEÆ.
F. B. I. i. 621
North-West Frontier Province.
Peshawar.
Rawulpindi.

medium size, branches much zig-zagged, spines 1-3 ins. long, bearing leaves and flowers ; leaves 1-1½ by ¾-1 in., obovate, crenate, leathery, smooth ; flowers in clusters shorter than the leaves ; fruit somewhat inflated, three and one-seeded cells ; in other respects like the last species.

**Gymnosporia or Celastrus montana,**
*Talkar, mareila, sheravane.*
CELASTRINEÆ.
F. B. I. i. 621.
The Plains to 2,000 ft.

large, branches stiff and nearly straight, spines axillary, straight, 1-2 ins. long, often bearing leaves and flowers ; leaves 1-3 by ¼-2 ins., linear, ovate to roundly ovate, minutely toothed or not, leathery ; flowers, in axillary or on the spines, much branched clusters, shorter than the leaves, small, greenish white, bracts, calyx lobes and petals fringed ; fruit round or ovoid, black, size of a pea, 1-3 celled, cells one-seeded ; in other respects like the last species.

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

**Rhus Cotinus, The wig tree, Venetian Sumach,** *Tunga, bhan, tung.* ANACARDIACEÆ. F. B. I. ii. 9. Himalaya, 3-5,000 ft. Hazara (Barrett). Valleys below Simla. (Collett).

large, bark reddish brown, branchlets red, young parts grey woolly; leaves 2-4 by 1½-3 ins., stalks, 1½-3 ins. long, ovate or round, polished above, slightly woolly beneath; flowers very small, pale yellow, $\frac{1}{10}$ in. diam., few on very slender long stalks forming loose feathery, pale, purple bunches, sepals linear, oblong, petals longer than the sepals, stamens 5, styles 3; drupe ⅛ in. long, compressed reddish covered with white hairs. The wood under the name of Young Fustic is much used in Europe for dyeing wool scarlet or orange. The bark and leaves are used for tanning.

**Crotolaria Burhia,** *Khip, sis, karsan.* LEGUMINOSÆ. F. B. I. ii. 66. The Plains to 4,000 ft. Sargodha (Doule).

small, branches numerous, stiff, ending sometimes in spines, with fine pale felt; leaves few, scattered, almost sessile, ¼-1½ ins. long, silky, ovate or lanceolate; flowers yellow 6-12 in terminal racemes, flower stalks very short with two bracteoles, calyx densely silky, teeth lanceolate, corolla yellow with reddish veins, hardly protruding, stamens 10, united, style long, hairy above; pod 3-4 seeded hardly longer than the calyx, oblong, hairy. The fibre is sometimes used in place of hemp.

**Crotolaria albida,** LEGUMINOSÆ. F. B. I. ii. 71. The Plains to 7,000 ft. Simla (Collett).

small, branches many, firm, round, slender, somewhat silky; leaves nearly sessile, 1-2 ins. long, firm, gland-dotted, narrow, oblong, smooth above, silky beneath, flowers, ⅓ in. long, pale yellow, usually in terminal racemes, calyx top-shaped, ¼ in. long, thinly silky, longer in fruit, teeth long, 3 lower linear, 2 upper broader and blunter; corolla pale yellow, rarely tinged with lilac, hardly protruding, stamens 10 united, style long, hairy above; pod ½-⅝ in. long, sessile, twice as long as the calyx, smooth, oblong, seeds 6-12.

**Crotolaria juncea,** *Sanai, arjha san.* LEGUMINOSÆ. F. B. I. ii. 79. The Plains.

medium size, cultivated; branches stiff, slender, silky; leaves at somewhat distant spaces, linear or oblong, 1½-3 ins. long, both surfaces shining with short brown silky hairs, flowers 1 in. long in 12-20—flowered racemes, 6-12 ins. long, bracts minute, linear, calyx

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

$\frac{1}{2}$-$\frac{3}{4}$ in. long covered with rusty velvety hairs, teeth very deep, linear, corolla bright yellow, smooth, protruding a little out of the calyx, stamens 10, united, style long, hairy above; pod 1-1$\frac{1}{4}$ ins. long, covered with silky hairs seeds 10-15. The fibre is much used for making cordage and sacking.

**Itea nutans,**
*Lelar gurhath.*
SAXIFRAGACEÆ.
F. B. I. ii. 408.
Himalaya, 3-6,000 ft.
Sutlej Valley, Suni (Collett).

large, bark dark grey, leaves 4-6 by 1$\frac{1}{2}$-2$\frac{1}{2}$ ins., ovate oblong, long-pointed, glandular-toothed, leathery, dark green, shining above, leaf stalk 1-1$\frac{1}{4}$ ins. long, stout; flowers white, $\frac{1}{10}$ in. long, in clusters of 3-7 forming velvety, drooping racemes 4-8 ins. long, calyx velvety, tube bell-shaped, lobes 5, persistent, petals 5, twice the length of the calyx lobes, linear, erect, stamens 5; capsule $\frac{1}{5}$ in. long, separating into 2 valves through the cell partition and the style, seeds many.

**Osbeckia stellata,**

see Shrubs, Opposite, Exstipulate, Simple.

**Lagerstrœmia indica,**

see Shrubs, Opposite, Exstipulate, Simple.

**Opuntia Dillenii,**
**Prickly Pear,**
**Cactus,**
*Nagphana.*
CACTACEÆ.
F. B. I. ii. 657.
The Plains to 7,000 ft.
Native of South America.

medium size, stem flat or round or angled, fleshy, armed with barbed bristles in clusters; leaves fleshy, soon falling off; flowers orange red, solitary, sessile, calyx lobes 3-many, small, overlapping, petals many, free or shortly united below, stamens many; fruit one celled, pulpy, seeds many, oblong or kidney shaped; coccus cacti, the cochineal insect lives on this plant—It is much used for hedges.

**Andrachne cordifolia,**
*Kurkni, gurguli, bersu.*
EUPHORBIACEÆ.
F. B. I. v. 283.
Himalaya, 5-8,000 ft.
Simla, Mashobra (Collett).
Changagalli (Douie).

small, branches slender, round, smooth; leaves long-stalked, 1-3$\frac{1}{2}$ by $\frac{1}{2}$-1$\frac{1}{2}$ ins., thin, margin smooth, ovate oblong, tip rounded, base rounded, stalk $\frac{1}{4}$-$\frac{3}{4}$ in. long, flowers $\frac{1}{6}$ in. diam. green on long, slender axillary stalks, the males in clusters, females solitary, calyx 5 lobed petals 5, stamens 5, females without petals, styles 3, divided into 2 long branches; fruit $\frac{1}{4}$ in. diam, round with a depression above, seeds 6, triangular.

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## SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

### PETALS UNITED.

### FLOWERS MINUTE IN HEADS.

**Vernonia cinerascens,**
COMPOSITÆ.
F. B. I. iii 257.
The Plains.
The Salt range.
Waziristan, Baluchistan.

medium size, much branched, grey, velvety, branches grooved, white; leaves ½-1½ ins., oblong, rounded tapering to a narrow base, often with an abrupt tip, sometimes toothed, gland-dotted, velvety on both surfaces; flowers purple in solitary heads, ¼ in. diam., on the ends of the branches of flat-topped clusters, bracts round the heads, ⅛ in., in many series, linear, inner longest, calyx of hairs (pappus) ⅙ in., white, persistent, corollas smooth, slender, all tubular, teeth 5, narrow, anther bases blunt, style-arms long, hairy all round, short pointed; achenes (seeds) 1/10 in., 5-ribbed, tapering to the base, covered with rather stiff hairs.

**Pluchea ovalis,**
COMPOSITÆ.
F. B. I. iii. 272.
The Salt range (Aitchison)

large, branches with broad green toothed wings; leaves 2-½ by ¾-1 in., sessile, oblong, coarsely toothed, tips rounded, flowers white yellow or lilac in heads in compound hairy terminal leafless flat clusters, heads ¼ in. diam., discoid, flowers all tubular, outer bracts of heads short-pointed, seeds small, 4-5-angled, smooth, tuft of hairs on top, slender.

**Pluchea Wallichiana,**
COMPOSITÆ.
F. B. I. iii. 272.
The Plains (Falconer and Stewart)

large, velvety with glands and hairy, branches not winged; leaves 1-2 ins. long, sessile, oblong and ovate with broad tip, slightly toothed, rigid, nerves prominent above and below; flowers white, yellow or lilac in heads in compound terminal flat leafless clusters, heads ¼ in. diam.; flowers all tubular, outer bracts of heads woolly, somewhat pointed, seeds small, 4-5-angled, tuft of hairs, reddish.

**Pluchea lanceolata,**
*Sermai, e hami.*
COMPOSITÆ.
F. B. I. iii. 272.
The Plains.

small, greyish, hairy, velvety, branches slender; leaves 1-2, oblong, sessile, narrowed to the base, margin smooth or toothed at the tip, nerves oblique, prominent on both surfaces; flowers white, yellow or lilac in heads in compound flat leafless clusters, heads ¼ in diam, longer than broad, bracts of heads short rounded blunt, outer ones with grey hairs. A weed of cultivation. The leaves are aperient and are used to adulterate senna.

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## Shrubs with Alternate Exstipulate Simple Leaves.

### Petals United.

#### Flowers minute in Heads.

**Pluchea arguta,**
Compositæ.
F. B. I. iii. 278.
The Plains (Aitchison).

medium size, branches, stout, velvety with glands; leaves 1-1½ by ⅙ ⅔ in., sessile, lanceolate or ovate with broad tips, coarsely toothed, base with ear shaped projections or not; flowers white, yellow or lilac in heads stalked solitary or few, hardly in clusters, heads ⅓-½ in. diam., bracts of heads narrow, sharp pointed, rigid.

**Inula Cappa,**
Co positæ.
F. B. I. iii. 295.
Himalaya, 4-6,000 ft.
Valleys below Simla (Collett).
Hazara (Barrett).

medium size, scented, branches thick, densely woolly as also are under surface of leaves and flower clusters, leaves 3-6 by 1-2½ ins., leathery, sessile or shortly stalked, toothed, silky velvety beneath, teeth close set; flowers all tubular or a few radiate, in many heads ⅓ in. diam., yellow, in rounded clusters, bracts round the heads linear stiff, sharp-pointed, outer ones shortest; seeds $\frac{1}{20}$ in., silky, tufts of hairs (pappus) ⅛ in., grey, hairs thickened at the ends.

**Inula cuspidata,**
Compositæ.
F. B. I. iii. 296.
Himalaya, 4-7,000 ft.
Simla (Collett).

medium size, nearly smooth; branches slender; leaves 5 by 2 ins., stalked, ovate-lanceolate, thin, long pointed, young velvety, old rough above; flowers yellow, outer ones radiate, in many heads, ⅓ in. diam., on slender stalks crowded in broad terminal clusters, bracts of heads linear, sharp-pointed, stiff, seeds $\frac{1}{15}$ in., tufts of hairs (pappus) ⅛ in., yellowish, hairs thickened at the tip.

**Pulicaria crispa,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed, Petals United.

**Pulicaria glaucescens,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Toothed, Petals United.

#### Flowers not in Heads

**Gaultheria nummularioides,**

see Prostrate Shrubs, Alternate, Exstipulate, Simple.

**Gaultheria trichophylla,**

see Prostrate Shrubs, Alternate, Exstipulate, Simple.

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNITED.

FLOWERS NOT IN HEADS.

**Cassiope fastigiata,**
ERICACEÆ.
F. B. I. iii. 459.
Himalaya, 10-14,000 ft.
Hattu (Collett).
Marali (Bamber).

small, dense tufts of parallel erect branches, 6-12 ins. high, leaves $\frac{1}{5}$ in. ovate oblong, overlapping, pressed against the branches, thickened on the back, hairy; flowers white on solitary stalks or in twos or fours; sepals $\frac{1}{8}$-$\frac{1}{6}$ in., short-pointed, nearly smooth, margins often toothed and membranous, corolla $\frac{1}{4}$-$\frac{1}{3}$ in., widely bell-shaped, fleshy; capsule round, point depressed.

**Rhododendron campanulatum,**
*Cherailu, sarngar, gaggaryurmi.*
ERICACEÆ.
F. B. I. iii. 466.
Himalaya, 9-14,000 ft.
The Chor (Collett).
Marali (Bamber).

medium size, bark thin grey; leaves 3-5 ins. long, oblong, rounded at both ends, crowded at the end of branches, leathery, dark green, smooth above, cinnamon felted beneath; flowers mauve in large clusters, stalks as long as the corolla tube, bracts silky, calyx teeth broadly triangular, small, corolla bell-shaped, 1-1$\frac{1}{2}$ by $\frac{1}{2}$-1 in., lobes 5, stamens 10; capsule cylindrical, 1 in. long, curved; seeds linear oblong, flattened. The powdered leaves are mixed with tobacco and used as snuff in colds.

**Rhododendron lepidotum,**
*Talisfur, taliori.*
ERICACEÆ.
F. B. I. iii. 471.
Himalaya, 8-15,000 ft.
Simla, Jacko, Hattu (Collett).
Marali (Bamber).

small, scented, young parts covered with silvery and golden scales, branches rough; leaves $\frac{3}{4}$-1 in. long, ovate with broad tips, base narrow, nearly sessile at the ends of branches, smooth above, silvery beneath; flowers red, yellow or purple, solitary or 2-3 together; stalks $\frac{1}{2}$-1$\frac{1}{2}$ ins. long, very rough, calyx teeth oval, corolla tube short, lobes round, spreading $\frac{1}{5}$-$\frac{1}{6}$ in. long, stamens 8-10, hairy below; capsule $\frac{1}{4}$-$\frac{1}{3}$ by $\frac{1}{8}$-$\frac{1}{4}$ in., erect. The smoke of the leaves is used in native medicine as a stimulant.

**Rhododendron Anthopogon,**
*Nichni, kaizaban, tazaktzun.*
ERICACEÆ.
F. B. I. iii. 472.
Himalaya, 11-16,000 ft.
The Chor (Collett).
Marali (Bamber).

small, scented, branchlets rough and scaly; leaves 1-1$\frac{1}{2}$ in. long, broad oblong, shining above, cinnamon felted beneath, stalk $\frac{1}{10}$-$\frac{1}{4}$ in. long; flowers yellowish white in small terminal clusters, calyx teeth oblong, thin, margins hairy, corolla tubular, mouth dilated, tube $\frac{1}{5}$ in. long, lobes ovate with broad tips, spreading, stamens 6-8; capsule $\frac{1}{5}$ in. long, ovoid. The leaves are used for the same purpose as those of the last species.



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## Shrubs with Alternate Exstipulate Simple Leaves.

### Petals United.

**Moesa indica,**

see Trees, Alternate, Exstipulate, Simple.

**Myrsine africana,**
*Bebrang, kakhum, shamshad.*
Myrsineæ.
F. B. I. iii. 511.
Salt Range.
Himalaya, 1-8,500 ft.
Simla (Collett).
Murree (Donie).

small or large, branchlets rusty velvety; leaves $\frac{1}{2}$-$1\frac{1}{2}$ ins. long, nearly sessile, lanceolate, gland dotted, sharply toothed; flowers small, nearly sessile in clusters of 3-8, calyx 4-lobed, free, persistent, corolla 4-lobed, rotate, stamens 4, stigma rounded, style 2-4 branched; berry $\frac{1}{6}$ in. dia., red, round, edible. The fruit is sold in bazaars as a strong purging vermifuge.

**Myrsine semiserrata,**
*Parwana, gogsa, gaunta.*
Myrsineæ.
F. B. I. iii. 511.
Himalaya 3-9,000 ft.
Simla, The Glen (Collett).

large, bark ashy, smooth; leaves 2-5 by $\frac{1}{2}$-$1\frac{1}{2}$ ins., smooth, leathery, lanceolate sharply toothed towards the tip, gland dotted, stalk $\frac{1}{10}$-$\frac{1}{4}$ in. long; flowers in axillary clusters, stalks $\frac{1}{4}$ in. long, calyx and corolla 4—rarely 5-lobed, $\frac{1}{10}$ in. diam., stamens 4, rarely 5, style with 2-4 flat spreading branches, berry red, round $\frac{1}{6}$-$\frac{1}{5}$ in. diam.

**Embelia robusta,**
*Bayabirang.*
Myrsineæ.
F. B. I. iii. 515.
The Plains to 5,000 ft.
Near the Jumna.

large, bark brown with horizontal cracks on the branches, and small warty excrescences; leaves $3\frac{1}{2}$-7 by 2-$3\frac{1}{4}$ ins., oblong or lanceolate with broader tip, base narrowed, margin undulate, short-pointed, rusty velvety beneath, nerves prominent, stalk glandular, usually grooved; flowers small in simple or clustered racemes of 1-2 ins. in length, calyx 5-lobed, persistent, petals 5, oblong, reflexed, stamens 5 on the petals, styles short persistent; fruit a dry berry, red, round with ribs and crowned by the style; seed usually one, round with a hollow base. The fruit is used for the same purpose as that of *Myrsine africana.*

**Ardisia humulis,**
Myrsineæ.
F. B. I. iii. 529.
The Plains to 5,000 ft.

large, smooth, branched; leaves 4-8 by $1\frac{1}{2}$-$3\frac{1}{2}$ ins., oblong or ovate with broad tip, short pointed, leathery, fleshy, margin smooth; flowers pink, $\frac{1}{2}$ in. diam., in axillary clustered racemes, stalks 1-2 ins. long, bracts soon falling off, calyx lobes 5, blunt, oval, corolla 5-lobed, stamens 5; fruit round, black when ripe, size of a pea, crowned with the style, full of pink juice, seed one.

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNITED.

**Reptonia buxifolia,**
*Gurgura.*
MYRSINEÆ.
F. B. I. iii. 534.
Peshawar.
Salt Range.
Trans Indus Hills, 2-3,000 feet.

large, spinous or not; branches grey; leaves 1½ by ⅔ in., shortly stalked, ovate with a broad blunt tip, base narrowed, margin smooth, recurved, leathery, smooth above, slightly velvety beneath; flowers small, greenish yellow, sessile in axillary tufts, calyx lobes 5; round, overlapping, corolla tube short, lobes 5, oblong, blunt, stamens 5, alternating with 5 processes; fruit round, fleshy, edible, ¼-⅓ in. diam., one— or rarely two-seeded; seed round with hollowed base.

**Rhazya stricta,**
*Vena, gandera, vargalam.*
APOCYNACEÆ.
F. B. I. iii. 640.
Salt Range.
Peshawar.
Trans Indus Plains.

small, smooth, stout, series of stems in clumps, milky juice from young parts; leaves 3-4 by ½-¾ in., oblong-lanceolate, short-pointed, sessile, leathery and yellow when dry; flowers white, in dense terminal short axillary stoutly branched and shortly stalked clusters, bracts awl-like and persistent, calyx short, lobes 5, short pointed, corolla circular, tube cylindric ⅓ in., lobes 5, short, broad overlapping to the left, stamens 5, above the middle of corolla tube, but not protruding; follicles two, erect, 2-3 by ¼ in., slightly flattened, rather leathery, seeds ⅓ in. long angularly flattened, shortly winged. The leaves, flowers, and fruit are used in rheumatism and other joint affections, the dried fruit is used to coagulate milk.

**Nerium odorum,**
**Oleander,**
*Kanér, ganhira.*
APOCYNACEÆ.
F. B. I. iii. 654.
The Plains to 5,000 ft.
In dry ravines.
Hazara (Barrett).

medium size, bark silvery grey, from young parts a milky juice exudes; leaves in whorls of three, 4-6 by ½-1 in., linear lanceolate, thick, leathery, long pointed, dark green shining above, rough and dotted beneath, stalk short; flowers red, pink, or white, usually sweet scented, sometimes double, in large terminal branching clusters, sepals broad, awl-pointed, corolla 1½ ins. across, funnel shaped, lobes spreading, rounded, overlapping to the left, tube ¾ in. long, 5 fringed scales on throat, stamens inserted near the mouth of the tube forming a cone, each prolonged up in a long thread-like hairy appendage; follicles narrow, 6-9 by ¼-⅓ in., straight, united below; seeds many, crowned with a tuft of hairs. The leaves are poisonous to all animals but goats. An oil extracted from the root bark is used in skin diseases, especially in

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNITED.

leprosy. A yellow resin present in this plant is an active heart poison.

**Ehretia obtusifolia,**
*Chamror, bari kander, khabarra.*
BORAGINACEÆ.
F. B. I. iv. 143.
Salt Range.

medium size ; leaves oblong ovate with broad blunt tip, 1-1$\frac{3}{3}$ ins. long, wedge shaped at the base ; flowers larger than *Ehretia lævis*, which see under Trees, Alternate, Exstipulate, Simple.

**Heliotropium zeylanicum,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Heliotropium dasycarpum,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Heliotropium Eichwaldi,**

see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

**Breweria latifolia,**
CONVOLVULACEÆ.
F. B. I. iv. 224.
The Plains of the Western Punjab.

small, stiff, rough, much branched, densely silky ; leaves $\frac{1}{4}$-$\frac{3}{4}$ in., oblong with rounded ends, margins entire ; flowers $\frac{1}{4}$ in. sessile, pinkish, 1-3 together, axillary, bracts small, calyx-lobes 5, long-pointed, very silky ; corolla funnel-shaped barely 5-lobed, folding at the angles, stamens 5 enclosed in the corolla-tube, styles 2 nearly ununited from the base ; capsule $\frac{2}{5}$ in., ovoid, 4-seeded, seeds ovoid-oblong smooth.

**Cressa cretica,**
CONVOLVULACEÆ.
F. B. I. iv. 225.
The Plains.

small, stem 6-18 ins. high ; leaves $\frac{1}{4}$-$\frac{1}{3}$ in. long, sessile, oblong, short pointed ; flowers small, in terminal spikes or clusters or sessile in the axils of upper leaves, sepals $\frac{1}{8}$ in. long, equal, corolla $\frac{1}{6}$ in. long, funnel-shaped, white or pink, lobes 5, reflexed, stamens 5, project beyond the corolla, styles 2, linear ; capsule 4 valved, seeds 4, smooth.

**Solanum dulcamara, Woody Nightshade,**
*Ruba barik.*
SOLANACEÆ.
F. B. I. iv. 229.
Himalaya, 4-8,000 ft.
Narkunda (Collett).

small, branches long, trailing, smooth or velvety ; leaves 1-3 ins. long, ovate oblong or lobed, long pointed, smooth, stalk 1 in. long ; flowers purple, $\frac{1}{2}$-$\frac{3}{4}$ in. diam., in loose hanging clusters, calyx teeth 5 blunt, $\frac{1}{20}$ in. long, corolla lobes 5 curved back, stamens 5, anther tips meeting above ; berry $\frac{1}{4}$ in. diam., round, red, seeds many, $\frac{1}{16}$ in. dia., smooth.

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNITED.

**Solanum verbascifolium,**
*Kala mewa, tiari, ola.*
SOLANACEÆ.
F. B. I. iv. 230.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

large, woolly with star-shaped hairs at end of branches and flower stalks, bark light grey; leaves 7-9 by 3-5, oblong, narrowed at both ends, margins smooth, tip long-pointed; flowers white, ½-¾ in. diam., crowded in stalked branched clusters, corolla woolly without, stamens 5, anther tips meeting above: berry ⅓ in. diam., round, smooth yellow, seeds many, ⅛ in. diam.

**Withania somnifera,**
*Agsend, ak, aksan.*
SOLANACEÆ.
F. B. I. iv. 239.
The Plains.
Lahore.

small, thinly woolly, branches round; leaves 2-4 ins. long, ovate short pointed, stalk ¼-½ in.; flowers greenish yellow, axillary, sessile or shortly stalked in clusters, or solitary, calyx in flower ⅕ in., in fruit ¾ in., bell-shaped, 5-6 toothed, in fruit enlarged and nearly round, papery, corolla bell-shaped ¼-½ in., lobes 3-6, short; berry round, ¼-⅓ in. diam., seeds many, $\frac{1}{12}$ in. diam. The root is narcotic and diuretic.

**Withania coagulans, The Cheesemaker,**
*Panirband, spinbajja.*
SOLANACEÆ.
F. B. I. iv. 240.
The Plains to 3,000 ft.
Sutlej Valley (Collett).
Shahpur (Douie).

small, greyish from minute star-shaped hairs; leaves 1-2 ins. long, oblong, blunt, thick, narrowed at the base, very shortly stalked; flowers pale yellow, mealy from the minute star-shaped hairs outside, ½ in. diam. in short stalked hanging axillary clusters, calyx ⅕ in. in flower, ⅔ in. in fruit, velvety, corolla bell-shaped, lobes turned back; berry and seeds as in the last species *W. somnifera*. The fruit is emetic when fresh, anodyne and carminative when dry.

**Lycium europæum,**
*Kangu, mral, chirchitta.*
SOLANACEÆ.
F. B. I. iv. 240.
The Plains to 5,000 ft.

small, spinous; leaves ½-1 in. long, often clustered at the joints, linear-oblong; flowers purplish white, ½ in. diam., solitary or in clusters at the joints, calyx often 2 lipped, 5 teeth, not larger in fruit, ⅛ in. corolla, funnel-shaped, lobes 5-4, half the length of the tube, stamens 5-4 on the corolla tube, smooth at the base berry ⅙ in. diam., nearly round, many seeded. The berries are edible and considered to be aphrodisiac.

**Lycium barbarum,**
*Barghauna.*
SOLANACEÆ.
F. B. I. iv. 241.
The Plains to 3,000 ft.
Lahore.

same as the last species except that the corolla lobes are more than half as long as the tube.

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS UNITED

**Lycium ruthenicum,** *Kichar, kitserma.* SOLANACEÆ. F. B. I. iv. 241. Kashmir, 6-9,000 ft.

same as the last species except that the leaves are linear, calyx is 3-4 lobed and the stamens are hairy at the base.

PETALS NONE.

**Dodonæa viscosa,** *Sanatta, mendu, ghuraske.* SAPINDACEÆ. F. B. I. i. 697. The Plains to 4,000 ft. Salt Range. Hazara. (Barrett).

medium size, evergreen, young leaves and shoots sticky with yellow resinous dots, smooth red branchlets ; leaves nearly sessile, 1½-3 by ⅕-1 ins., lanceolate with a broad tip to linear wedge shaped, leathery ; flowers small, yellow in short terminal racemes, sepals 5, ovate, petals none, stamens usually 8 , capsule 3-(or 2-4) celled, valves winged on the back, wings membranous round, broad ; seeds 1-3. This plant is often grown as a hedge plant.

**Bosia Amherstiana,** AMARANTACEÆ. F. B. I. iv. 716. Himalaya, 4-7,000 ft. Simla (Collett) Diktali in Giri Valley.

medium size, stout, smooth, branches long, straggling ; leaves 3-7 by 1-4 ins., ovate, shortly stalked, short pointed, base pointed or rounded, narrowed into the stalk ; flowers green with white margins, ⅙ in. diam., nearly sessile, crowded in axillary, simple or branched spikes, never longer than the leaves, or in branched terminal racemes, sexes usually separate, sepals 5, rounded, concave, stamens 5, bracteoles 2-4 ; berries ⅙ in. diam., round, red.

**Ærua javanica,** *Böikalan.* AMARANTACEÆ. F. B. I. iv. 727. The Plains.

small, grey woolly, stem rounded, 2-3 ft., branched, ⅓ in. thick ; leaves 1-4 ins., flat or with margins curved down, sessile or narrowed into the stalk, linear or oblong ; flowers $\frac{1}{10}$ in. long, covered with white wool in long spikes ; sexes usually separate, sepals 4-5, woolly, stamens 4-5, joined below, alternating with linear staminodes in a cup, styles short or long ; fruit dry, ovoid, surrounded by the sepals with one seed.

**Eurotia ceratoides,** CHENOPODIACEÆ. F. B. I. v. 8. Himalaya, 8-14,000 ft.

small, grey with star-shaped hairs ; leaves ½-1½ ins. long, linear-oblong, blunt, floral leaves narrower, margin often curved down ; flowers minute, no petals, fruiting bracts with long red brown silky hairs ⅓ in. long, stamens 4, sepals 4, in female flowers bracts 4, joined together, stigmas 2, seed one.

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## Shrubs with Alternate Exstipulate Simple Leaves.

### Petals None.

**Suæda fruticosa,**
*Lána, askasa, zamar.*
Chenopodiaceæ.
F. B. I. v. 1[illegible].
The Plains

small, stem and branches slender, the latter many; leaves $\frac{1}{8}$-$\frac{1}{2}$ in. long, linear and $\frac{1}{2}$ cylindrical blunt. floral leaves very small, fleshy; flowers minute on leafy spikes, bracteate and 2 bracteolate, 5 lobed, equal or unequal, stamens 5, short; styles 3, seed coat black shining. The leaves are used in ophthalmia and used in making coarse soda (sajji).

**Salsola fortida,**
*Motilane, gorolane, shora.*
Chenopodiaceæ.
F. B. I. v. 18.
The Plains.

small, pale grey, much branched; leaves minute fleshy, nearly round, floral leaves longer overlapping; flowers small, 5 oblate, axillary or on short spikes, bracteoles leaf-like, sepals 4-5, concave, $\frac{1}{10}$ in. across, silvery white, winged, stamens 5 or less on separate flowers from those the 2-3 linear stigmas, which are often turned down, the little flowers look like silver stars among the leaves, galls $\frac{1}{4}$-$\frac{3}{4}$ in. diam., often found on the branchlets. Manna is sometimes obtained from the surface of the leaves and the plant is used in making coarse soda.

**Salsola verrucosa,**
Chenopodiaceæ.
F. B. I. v. 18.
North-West Frontier Province.

large, stout, like the last species, but the flowers are larger $\frac{1}{4}$-$\frac{1}{3}$ in. diam., dark-brown.

**Daphne oleoides,**
*Kutilal, shing, kagsari.*
Thymelæaceæ.
F. B. I. v. 193.
Himalaya, 3-9,000 ft.
Simla (Collett).
Hazara (Barrett).

small, branches many, velvety; leaves, sessile 1-2$\frac{1}{2}$ ins. long, ovate or lanceolate with broad tip, sharp pointed or blunt, sometimes a little hairy; flowers pinkish white, $\frac{1}{12}$ in. long in terminal clusters, calyx tubular, 4 spreading lobes, ovate, no bracts; stamens 8 in two series nearly sessile; fruit is a berry dry or fleshy, $\frac{1}{4}$-$\frac{1}{2}$ in. long, orange or scarlet, seed one. The leaves are poisonous to camels. The bark is considered to be an alterative and used in diseases of the bones.

**Daphne cannabina,**
*Satpura, niggi, jeku.*
Thymelæaceæ.
F. B. I. v. 193.
Himalaya, 5-7,000 ft.
Simla (Collett).

medium size, branches smooth, leafy at the tips; leaves 2-4 ins. long, nearly sessile, lanceolate, rather leathery; flowers sessile $\frac{1}{2}$ in. long, white in bracteate terminal clusters, calyx tubular, woolly outside, scented, lobes 4, ovate, stamens 8 in two series, nearly sessile; berry $\frac{1}{2}$ in. long, ovoid, orange to red,

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS NONE.

fleshy. The plant supplies a useful fibre which is used in paper making, especially in Nepal paper.

**Wikstræmia canescens,**
*Bhat niggi, thilak.*
THYMELÆACEÆ.
F. B. I. v. 195.
Himalaya, 5-9,000 ft.
Narkanda, Patarnala (Collett).

small, branches slender, silky, velvety; leaves 1-3 ins., shortly stalked, oblong-lanceolate, thin, often with a white bud in the axil; flowers yellow or white in axillary or terminal few clusters or spikes without bracts, calyx tube $\frac{1}{4}$-$\frac{1}{3}$ in. long, lobes 4, spreading, short, blunt, scales 1-4 linear within the tube, stamens 8, short, within and upon the tube, in two rows; fruit $\frac{1}{4}$ in. long, narrowly ovoid, black, within the calyx tube at first. This plant is also used in paper making and the fibre forms good cordage.

**Elæagnus umbellata,**
*Gham, kankol mirch, bammewa.*
ELÆAGNACEÆ.
F. B. I. v. 201.
Himalaya, 3-10,000 ft.
Simla, Mashobra (Collett).
Hazara (Barrett).

medium size, spinous, branches dark; leaves 1-3, by $\frac{1}{2}$-1 in., oblong lanceolate, blunt, smooth or with star-shaped hairs above, silvery scaly beneath, stalk $\frac{1}{4}$ in.; flowers white, scented, silvery without, in small axillary clusters, appearing with the leaves, calyx $\frac{1}{2}$ in. long, silvery, tube slender, funnel-shaped, teeth 4, broadly triangular, stamens 4; fruit $\frac{1}{3}$ in. long, oblong succulent, edible, stone bony, ribbed, woolly within. The seeds and flowers are used as a stimulant in coughs, and as a substitute for black pepper.

**Hippophaë rhamnoides,**
**Sea Buckthorn,**
*Kala bisa, tserkar, sirma.*
ELÆAGNACEÆ.
F. B. I. v. 203.
Himalaya, in the beds of streams, 7-12,000 ft.
Lahoul, Pangi.

large, spinous, bark dark grey, rough with vertical furrows, branches stiff with silvery twigs and leaves; leaves $\frac{1}{2}$-2 ins. by $\frac{1}{10}$-$\frac{1}{4}$ in., linear oblong to ovate with broad tip, rather leathery, smooth above, felted beneath with grey or rusty scales; flowers male in axillary clusters, female solitary, calyx in male in two segments, in female two toothed, in male stamens 4; fruit $\frac{1}{4}$ in. long, ovoid, orange or scarlet, succulent, acid but edible, seed oblong, shining. The fruit is very acid and used as a syrup for coughs.

**Hippophaë salicifolia,**
*Surch, dhur chuk, chuma.*
ELÆAGNACEÆ.
F. B. I. v. 203.
Himalaya, 5-10,000 ft.
Sutlej Valley (Collett).

large, spinous, willow-like, leaves 2-4 ins., linear lanceolate dark green above, covered with stellate hairs and few scales, beneath otherwise like the last species.

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SHRUBS WITH ALTERNATE EXSTIPULATE SIMPLE LEAVES.

PETALS NONE.

**Osyris arborea,**
*Dalmi, dalima.*
SANTALACEÆ.
F. B. I. v. 232.
Himalaya, 1-7,000 ft.
Simla (Collett).

large, young shoots sharply 3-angled ; leaves 1-2 ins. long, nearly sessile, oblong-ovate, tip short-pointed ; flowers very minute, yellow green, nearly sessile, calyx 3-4 lobed, male flowers in axillary clusters, female one to three together on long stalks ; fruit $\frac{1}{4}$ in., round, yellow to red, seed one, round. The leaves are made into Bischar tea, which is drunk in Ladak, but is very nauseating.

**Euphorbia Tirucalli,** see Shrubs, Opposite, Exstipulate, Simple.

**Sarcocca pruniformis,**
EUPHORBIACEÆ.
F. B. I. v. 266.
Himalaya, 5-9,000 ft.
Simla (Collett).
Hazara (Barrett).
Murree.

small, smooth, evergreen, branches green, rounded ; leaves 3-4 by $\frac{1}{2}$-1 in., nearly sessile, lanceolate, long pointed, dark-green, margin smooth; flowers $\frac{1}{3}$ in. long, pale yellow in short axillary racemes ; male flowers, sepals 4, oblong blunt, stamens 4, female flowers, sepals 4-6 of small overlapping scales, styles 2, long, recurved ; fruit $\frac{1}{3}$ in. long, ovoid, purple, stones 2-3.

**Flueggia microcarpa,**
EUPHORBIACEÆ.
F. B. I. v. 328.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

large, smooth, branchlets angled, flattened ; leaves in two rows, 1-3 ins. long, shortly stalked ovate or round, thin ; flowers minute, yellow green, in dense axillary clusters on separate stalks, male and female flowers on different plants, male sepals 5, round, oblong, concave, spreading, stamens 5, opposite sepals, around 3 styles, long linear, erect, female shortly stalked in clusters of 3-6, sepals erect, 5, styles 3-4 reflexed and each divided into 2 or 3, pointed narrow lobes ; fruit $\frac{1}{6}$-$\frac{1}{3}$ in. diam., dry, a few $\frac{1}{3}$ in., white fleshy, minutely dotted, seeds 3-6, minutely dotted.

**Flueggia Leucopyrus,**
EUPHORBIACEÆ.
F. B. I. v. 328.
The Plains.

same as last species, but branches twisted, spinous; leaves smaller 1in. long at most, longer stalked.

**Salix hastata,** see Shrubs, Alternate, Stipulate, Simple.



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## Shrubs with Alternate Exstipulate Simple Leaves.

### Petals None.

**Juniperus communis, Juniper,**
*Palthar, lewar, pama.*
Coniferæ.
F. B. I. v. 646.
Himalaya, 5-14,000 ft.
Hattu (Collett).
The Chor. (Bamber).

small, dense, erect, prostrate at high elevations' greyish green; leaves linear, $\frac{1}{4}$-$\frac{3}{4}$ in., straight in threes, pointed, concave above, convex below, male cones $\frac{1}{8}$ in. long, many, ovoid, female cones minute bud-like consisting of many overlapping bracts, fruits compound like a berry, purple black with a bloom, the bracts just visible, seeds 3. The berries are used in the distillation of gin, also as a diuretic, the wood and leaves are burnt in the Punjab for incense.

**Juniperus pseudo-sabina,**
*Bhil, bhentri.*
Coniferæ.
F. B. I. v. 646.
Himalaya, 9-15,000 ft.
Hazara (Barrett).

medium size, dark coloured bark; leaves of two kinds, those on lower branches $\frac{1}{3}$ in. long, linear, sharp pointed, spreading, those on the terminal branchlets $\frac{1}{10}$ in. long., broadly ovate, closely overlapping, tips free, back keeled; flowers like the last species; fruit erect, ovoid, $\frac{1}{4}$-$\frac{3}{8}$ in., one seeded.

**Juniperus recurva, Weeping Blue Juniper,**
*Bettar, bhentra, guggal.*
Coniferæ.
F. B. I. v. 647.
Himalaya, 7,500-15,000 ft.
The Chor (Collett).

medium size to small prostrate shrub, bluish green, branches twiggy with hanging branchlets; leaves in whorls of 3, $\frac{1}{5}$ in. long, curved, linear, sharp pointed, flat and bluish green above, curved and pale green below, cones terminal, male yellow; fruit ovoid, $\frac{1}{3}$-$\frac{1}{2}$ in., dark purple, seed solitary. The smoke of the burning green wood acts as a violent emetic, the leaves and wood are burnt as incense.

## Shrubs with Alternate Exstipulate Lobed Leaves.

### Petals Ununited.

**Ribes Grossularia, Rough Gooseberry,**
*Amlanch, kansi, teila.*
Saxifragaceæ.
F. B. I. ii. 410.
Himalaya, 9-12,000 ft.
Pangi (Watt).

small, usually 3 prickles beneath each leaf axil, stems smooth or with many prickly hairs; leaves nearly round with 3-5 lobes, often toothed, hairy beneath; flowers stalked in clusters of 1-3 flowers, stalks with bracts at the base and 2 bracteoles at the middle, calyx tube long, lobes 4-5 produced above the fruit, petals 4-5, small, stamens 4-5; berry $\frac{1}{2}$ in. long oblong, inedible, seeds several.

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SHRUBS WITH ALTERNATE EXSTIPULATE LOBED LEAVES.

PETALS UNUNITED.

**Ribes orientale,**
*Kaghak, nangke.*
SAXIFRAGACEÆ.
F. B. I. ii. 410.
Kashmir, 8-12,000 ft.
Baltistan.
Kaghan.

medium size, sticky with glands and minutely hairy ; leaves 1-1½ ins. diam., round kidney shaped, minutely toothed, 3-5 lobed ; flowers small, greenish in erect crowded racemes, bracts ⅛ in. long, linear, calyx tube hardly produced above the fruit, lobes 4-5, petals 4-5, stamens 4-5 ; berry ⅓ in. long, yellowish red, velvety with minute glands, seeds several.

**Ribes glaciale,**
*Kukuliya, mangle, durbui.*
SAXIFRAGACEÆ.
F. B. I. ii. 410.
Himalaya, 7-12,000 ft.
Hattu (Collett).
The Chor (Bamber).

small, smooth, often epiphytic ; leaves 1-3 ins. diam., cordate, 3-5 lobed, acute, often long pointed, midlobe largest, pale beneath ; flowers greenish brown, ¼ in. diam., in glandular racemes 1-2 in., long erect in flower, hanging down in fruit, male and female flowers usually on different plants, bracts narrowly lanceolate, longer than the flower stalks, calyx lobes oblong, 4-5, petals 4-5, stamens 4-5 ; berries ¼ in. long, smooth, red, sour, scarcely edible.

**Ribes nigrum,**
**Black currant,**
*Muradh, beli, shaktekas.*
SAXIFRAGACEÆ.
F. B. I. ii. 411.
Himalaya, 7-12,000 ft.
Changlagalli (Douie).
The Chor. (Bamber).

small, velvety ; leaves scented, 2-4 ins. diam., long stalked, lobes 3 or 5, smooth above, dotted with minute yellow glands below ; flowers green tinged with purple, ⅓ in. diam., stalks of lower flowers longest, in smooth drooping racemes 2-3 in. long, calyx tube produced above the fruit, gland dotted, lobes 4-5, petals 4-5, stemens 4-5 ; berry ⅓ in. diam., black, seeds several. The fruit is as large and palatable as the English Black Currant.

**Ribes rubrum,**
**Red currant,**
*Dak, phulanch, nabar.*
SAXIFRAGACEÆ.
F. B. I. ii. 411.
Himalaya, 8-12,000 ft.
Mahasu, Narkanda (Collett).
Changlagalli (Douie).

small, nearly smooth ; leaves 2-3 ins. diam., long-stalked, hairy at the base, ovate lobes, 3-5 acute, toothed, smooth or with few hairs above ; flowers greenish yellow, ⅓ in. diam., stalks short, bracts shorter than the stalks in smooth pendulous racemes 3-6 ins. long ; calyx tube above the fruit, lobes short, blunt, 4-5, petals 4-5 ; berry ¼ in. diam., red, rarely black, smooth, too acid to be palatable.

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SHRUBS WITH ALTERNATE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

**Tricholepis tibetica,**
COMPOSITÆ.
F. B. I. iii. 382.
Northern Kashmir, 8-12,000 ft.

small, branches clustered above, slender, twiggy ending in a stiff flower stalk with a small erect head; leaves 1-3 ins. long, sessile, leathery, very narrow blunt, lobed, upper $\frac{1}{2}$-1 by $\frac{1}{10}$-$\frac{1}{8}$ in., ovate, linear, margin not lobed; flowers scarlet, in heads $\frac{1}{2}$-$\frac{3}{4}$ in. diam., bracts round heads, outer ovate, needle pointed, inner lanceolate, needle pointed, $\frac{1}{2}$ in. long, corollas $\frac{1}{2}$ in.; long; fruit (achenes) $\frac{1}{6}$ in. long, rather ribbed, a brush of hairs on top of each achene $\frac{1}{3}$ in. long.

**Solanum dulcamara,**

see Shrubs, Alternate, Exstipulate, Simple.

**Solanum indicum,**
*Kandyari.*
SOLANACEÆ.
F. B. I. iv. 234.
The Plains to 5,000 ft. Valleys below Simla (Collett).

small, branches many, very prickly, prickles stout, flattened, often recurved; leaves 3-6 by 1-4 ins., ovate, lobed, star-shaped hairs above, woolly beneath, nerves prickly, stalk 1 in. long; flowers $\frac{3}{4}$-1 in. diam. in lateral woolly recemes, calyx 5 lobed $\frac{1}{6}$ in. triangular, very woolly, corolla lobes 5, broad triangular, woolly without, stamens 5, forming a cone; berry yellow, $\frac{1}{3}$ in. diam., round, smooth, protruding beyond the calyx lobes, seeds $\frac{1}{8}$ in. diam., discoid. The root is said to be aphrodisiac.

**Solanum Melongena, The Egg-plant,**
*Brinjal, bengan.*
SOLANACEÆ.
F. B. I. iv 235.
The Plains to 4,000 ft.

small, prickly or unarmed; leaves 3-6 by 2-4 ins., stalk 1 in., ovate lobed, star-shaped hairs beneath; flowers blue, 1-1$\frac{1}{4}$ in. diam., in short small clusters, calyx lobes $\frac{1}{4}$-$\frac{1}{2}$ in., oblong, linear, corolla shortly lobed, stamens 5, forming a cone; berry 1-9 ins., purple green, seeds very many, discoid. Generally cultivated.

**Solanum coagulaus,**
*Bari mauhari, tingi.*
SOLANACEÆ.
F. B. I. v. 236.
The Plains.

very like the last species, but the berry is only 1 in. diam., and yellow. The fruit is sometimes eaten fresh or pickled.

PETALS NONE.

**Ricinus communis, The Castor Oil Plant,**
*Arend, bedanjir, harnauli*
EUPHORBIACEÆ.
F. B. I. iv. 457.
The Plains.

large, stem hollow, young shoots bluish green; leaves 6-24 ins. diam., green to red, round, 5-7 lobed, lobes toothed, membranous, oblong to linear, sharp or long-pointed, stalk 4-12 ins. long; flowers $\frac{1}{2}$ in. diam. in terminal erect branching recemes, male and female on different plants, male flower, calyx membranous,

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## Shrubs with Alternate Exstipulate Lobed Leaves.

### Petals None.

3-5 segments, petals none, stamens very many, female flower, calyx like a folding bract or spathe, soon falling off, ovary 3-celled, styles short or long, undivided or in 2 or 3 parts ; capsule ½-1 in. long, oblong, smooth or with tubercles, seeds 3, oblong, spotted. The oil is used as a purgative, also as a lubricant and an illuminant. The plant is cultivated and is probably indigenous, and not a mere escape.

**Nannorhops Ritchiana,**
**Dwarf Palm,**
*Mazri, kilu.*
Palmaceæ.
F. B. I. vi. 429.
N.-W. Frontier Province.
Salt Range to 3,000 ft.

large, stem 8-10 ft. long, 4 ins. diam. ; leaves 2-3 ft. in diam., round, split into segments, stalk 6-12 ins., margins toothed, sheathing ; flowers small on a spike (spadix) with branches and branchlets forming a pyramid 2-3 ft. long, flowers in pairs, one sessile, the other stalked, contained in a small spathe (sheathing bract), the whole pyramid contained in a large spathe, sepals and petals 3 each, stamens 3 or 6, drupe round, size of a pea to a bullet, one-seeded. The leaves are made into matting, baskets and cordage.

## Shrubs with Alternate Stipulate Compound Leaves.

### Petals Ununited.

**Glycosmis pentaphylla,**
*Ban nimbu, potali, girgitti.*
Rutaceæ.
F. B. I. i. 499.
The Plains to 5,000 ft.

small, evergreen, smooth ; leaves of 3-5 leaflets, rarely one, stalk stout, leaflets 4-9 ins. long, ovate lanceolate, blunt or pointed, dark-green, smooth ; flowers white, scented, small in erect, terminal or axillary, branched racemes, calyx 4-5 lobed, lobes broad, petals 4-5, stamens 8-10 ; fruit round with a depression, ⅓ in. diam., white or pink, pulp sweetish, edible. The twigs are used as toothsticks.

**Murraya exotica,**
*Marchula, juti, bibsar.*
Rutaceæ.
F. B. I. i. 502.
The Plains to 5,000 ft.
Sutlej Valley (Collett).
Rawulpindi.

large, bark ash-coloured, smooth, young parts velvety ; leaves 4-5 ins. long, leaflets 3-7, 1-3 ins. long, shortly stalked, dark-green, smooth, ovate, oblique at the base, notched at the tip or pointed, gland dotted ; flowers white, scented, 1 in. long, in short axillary or terminal clusters, rarely solitary, calyx 5-lobed, lobes minute, short-pointed, petals 5, lanceolate, stamens 10 ; berry ½-¾ in. long, ovoid, pointed at each end, wrinkled, red, 1-2-seeded.

**Murraya Kœnigii,**

see Trees, Alternate, Exstipulate, Compound.

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SHRUBS WITH ALTERNATE EXSTIPULATE COMPOUND LEAVES.

PETALS UNUNITED.

**Limonia acidissima,**
*Beli.*
RUTACEÆ.
F. B. I. i. 507.
The Plains to 4,000 ft.
Valleys below Simla (Collett).

large, armed with long spines, smooth, white corky bark ; leaves 3-6 ins. long, stalk with broad wings, leaflets 5-9, ½-1½ ins. long, sessile, ovate lanceolate, long-pointed, gland dotted, toothed, tip notched ; flowers white, scented, ⅛ in. diam., in short axillary, often leafy racemes, calyx 4-lobed, persistent, petals 4, gland dotted, larger than the calyx, stamens 8 ; berry ⅛ in. diam., round, yellow turning to purple, acid, smooth, seeds 2-4.

**Picrasma quassioides,**
*Puthorin, tithu, hala.*
SIMARUBACEÆ.
F. B. I. i. 520.
Himalaya, 3-5,000 ft.

large, branches spotted, stout, bark very bitter, young parts velvety ; leaves 10-18 ins. long, leaflets 9-15, 2-4 ins. long, sessile, ovate lanceolate, long-pointed, toothed, the lowest pair much the smallest ; flowers ⅕ in. across, green in axillary branching recemes, calyx 4-5 lobed, very small, petals 4-5, much larger than the calyx, leathery and persistent in fruit, stamens 4-5, hairy at the base, fruit of 3-5 drupes, size of a pea, red or black, each one-seeded, sometimes eaten. The bark, wood, and root are very bitter, and might be used as a tonic instead of Quassia.

**Rhus parviflora, Sumac,**
*Tungla, tumra.*
ANACARDIACEÆ.
F. B. I. ii. 9.
Himalaya, 2-5,000 ft.

medium size, bark grey smooth, young rusty woolly ; leaves of 3 leaflets, stalk 1-2 ins., rusty woolly, leaflets 1-3 by ½-2 ins., the terminal one much the largest and often narrowed into a margined stalk, ovate with a broad tip, toothed, slightly hairy above, rusty woolly beneath ; flowers yellow green, $\frac{1}{10}$ in. diam. in hairy terminal, often leafy, branching racemes 12 ins. long, calyx lobes 4-6, ovate, hairy without, petals 4-6, twice as long as the calyx lobes, oblong, stamens 4-10 ; drupe ⅙ in. ovoid, shining brown, seed one. The fruit (tantarik) is sold in the bazaar as substitute for tamarind.

**Rhus Mysorensis,**
*Dasarni, dasan.*
ANACARDIACEÆ.
F. B. I. ii. 9.
The Plains.
N.-W. Frontier Province.
Sulliman Range, 3-5,000 ft.

small, branches springy, woody, often spinous, branchlets scurfy ; leaves of 3 leaflets, stalk ½-⅔ in. scurfy, leaflets ½-1½ ins. long, terminal much the largest, all sessile, scurfy beneath, tinged with red ; flowers $\frac{1}{12}$ in. diam. in slender scurfy axillary or terminal branching racemes, in other points like the last species. The bark is sometimes used for tanning.

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SHRUBS WITH ALTERNATE EXSTIPULATE COMPOUND LEAVES.

PETALS UNITED.

**Jasminum humile,**
*Chamba, jai, shing.*
OLEACEÆ.
F. B. I. iii. 602.
Himalaya, 2-5,000 ft.
Salt Range.
Simla (Collett).
Murree (Douie).

small, smooth, branches angular green ; leaves 2-4 ins. long, leaflets 2-10, 2-3 by $\frac{3}{4}$-$1\frac{1}{4}$ ins. ovate, acute or blunt at both ends ; flowers yellow in terminal clusters, many, $\frac{1}{2}$-$\frac{3}{4}$ in. long, calyx teeth 5, $\frac{1}{16}$ in. triangular, corolla united, lobes $\frac{1}{3}$ by $\frac{1}{6}$ in. flat circular, 5, stamens 2 in the corolla tube ; berries 2-lobed or 1-lobed, oblong with rounded ends, seeds one in each lobe. An aromatic essential oil is obtained from the flowers by native perfumers.

## ERECT HERBS.

HERBS ERECT WITH OPPOSITE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

**Spergula arvensis, Corn Spurrey,**
CARYOPHYLLACEÆ.
F. B. I. i. 243.
The Plains to 7,000 ft.
Simla (in corn fields) (Collett).

medium size, annual, branched from the root, knotty, often sticky ; leaves linear $\frac{1}{2}$-2 ins. in opposite clusters, half round, grooved below, rather fleshy, stipules thin dry, small ; flowers $\frac{1}{6}$-$\frac{1}{4}$ in. diam., in forked terminal clusters on long stalks, turned back after flowering, sepals 5, blunt, green, unjoined, petals 5, white, blunt slightly longer than the sepals, stamens 10, styles 5; capsule nearly round, shining, longer than the calyx, opening by 5 valves ; seeds many, keeled or narrowly winged, granular.

**Spergula pentandra,**
CARYOPHYLLACEÆ.
F. B. I. i. 243.
The Plains to 7,000 ft. (in corn fields).

much the same as the last species, but leaves bluish green, not grooved below, petals sharp pointed, styles 3, seeds smooth flattened, broadly winged.

**Spergula rubra, Sand Spurrey,**
CARYOPHYLLACEÆ.
F. B. I. i. 244.
The Plains.
Shahpur (Douie).

small, stems 6-8 ins. long, annual ; leaves $\frac{1}{2}$-1 in. long, linear, flat, fleshy, stipules split, broad, silvery, flowers $\frac{1}{4}$-$\frac{1}{3}$ in. diam., pink or white, sepals 5, lanceolate, blunt, margins thin, dry, petals 5, ovate with broad tips, shorter than the sepals, stamens 5 or 10, styles 3 ; capsule ovoid, longer than the calyx, seeds many, pale brown, rough, not winged.

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HERBS ERECT WITH OPPOSITE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

**Drymaria cordata,**
CARYOPHYLLACEÆ.
F. B. I. i. 244.
The Plains to 7,000 ft.

large, annual, smooth, found in shady moist places, branches forking into two, slender, 1-2 ft.; leaves flat, stalked, ovate or round tipped with an abrupt point, stipules of a few bristles, soon falling off; flowers $\frac{1}{6}$-$\frac{1}{4}$ in. diam., in axillary or terminal clusters, stalks slender, bracts with thin edges, sepals 5, green, petals 5; two-lobed, lobes narrow, not longer than the sepals, stamens 3-5, style short; capsule 3-angled 3-valved; seeds one to many, round, flattened, rough with hard projections.

**Polycarpon Loeflingiæ,**
CARYOPHYLLACEÆ.
F. B. I. i. 245.
The Plains.

small, annual, smooth or velvety, common in gardens and waste places; leaves flat, $\frac{1}{4}$-$\frac{3}{4}$ in. long, sharp-pointed or blunt, wedge shaped, linear-oblong, stipules small, thin, soon falling off; flowers $\frac{1}{8}$ in. diam. in clusters at the end of branches or in their forks, sepals 5, keeled, petals 5, thin, notched or not, stamens 3-5, style divided into three; capsule one-celled; seeds many, ovoid, grooved.

**Polycarpæa corymbosa,**
CARYOPHYLLACEÆ.
F. B. I. i. 245.
The Plains to 7,000 ft.
Giri Vally (Collett).

small, annual or perennial, much branched, grey woolly or velvety; leaves $\frac{1}{3}$-1 in. long, flat, narrow linear, long or short pointed or blunt, stipules lanceolate or awl-shaped, thin; flowers $\frac{1}{6}$ in. diam., white in terminal silvery much branched clusters, sepals 5, thin, lanceolate much longer than the petals and capsule, often coloured, petals 5, margin smooth or 2-toothed, stamens 5, style one, tip 3-toothed; capsule 3-valved, seeds many, ovoid or flattened.

**Portulaca quadrifida,** see Prostrate Herbs, Opposite, Stipulate, Simple Leaves.

**Mollugo hirta,** see Prostrate Herbs, Opposite, Stipulate, Simple Leaves.

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HERBS ERECT WITH OPPOSITE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

**Argostemma verticillatum,**
RUBIACEÆ.
F. B. I. iii. 43.
Himalaya 2-6,000 ft.
Simla (Collett).

small, annual, slender, nearly smooth, growing on wet rocks ; leaves in fours, sessile, unequal, lanceolate or ovate-lanceolate, 1-4 ins. long, stipules minute ; flowers $\frac{1}{3}$ in. diam. white, shining in terminal stalked clusters, calyx 5-toothed, teeth short-pointed, corolla wheel-shaped, 5-lobed, stamens 5, style slender, stigma round ; capsule thin, 2-celled ; seeds many.

**Hedyotis hispida,**
RUBIACEÆ.
F. B. I. iii. 60.
Himalaya to 5,000 ft.
Valleys below Simla (Collett).

small, annual, stems angular, rough, much branched, sometimes prostrate ; leaves sessile $1\frac{1}{2}$-$2\frac{1}{2}$ ins. long, very variable in width, linear-lanceolate, short or long-pointed, margins turned in, stipules very short with many stiff bristles ; flowers small, white, 2-6 in sessile axillary rounded clusters, calyx lobes 4, short-pointed, persistent, roughly bristly, corolla bell-or-funnel shaped, lobes 4, ovate or linear, stamens 4 in the throat of the corolla, style thread-like, stigma 2-lobed ; capsule ovoid or round, 2-celled, seeds many, minute.

**Hedyotis stipulata,**

see Prostrate, Herbs, Opposite, Stipulate, Simple.

**Oldenlandia corymbosa,**
RUBIACEÆ.
F. B. I. iii. 64.
The Plains to 6,000 ft.
Annandale, Simla (Collett).
Murree Hills (Douie).

small, annual, slender, minutely bristly ; leaves $\frac{1}{2}$-2 ins. long, linear-lanceolate, short pointed, margins often curved back, stipules small, thin, with long or short teeth or bristles ; flowers white, small, solitary on long slender axillary stalks, or 2-4 in a small cluster, calyx-tube ovoid, teeth 4, narrow pointed, corolla flat and circular topped, lobes 4, tube short, stamens 4, within the corolla tube, style short, stigma 2-lobed ; capsule round, not ribbed, 2-celled, opening at the top, seeds many, minute.

**Oldenlandia aspera,**
RUBIACEÆ.
F. B. I. iii. 68.
The Plains.

small, annual, thick, stem rough, branching in threes ; leaves 2-3 ins. long, in clusters, narrow linear, short pointed, margins turned under, leathery, stipules thin with 1-3 terminal bristles ; flowers blue, $\frac{1}{5}$ in. long, nearly sessile, solitary or in pairs on three branching clusters, calyx teeth 4, much shorter than the corolla tube, awl-shaped, corolla funnel-shaped, tube $\frac{1}{10}$ in. long, slender, lobes 4, stamens 4, within



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HERBS ERECT WITH OPPOSITE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

the corolla tube, style short, stigma 2-lobed ; capsule round, $\frac{1}{6}$ in. diam. rough, seeds many, angled.

**Oldenlandia coccinea,**
RUBIACEÆ.
F. B. I. iii 69.
Himalaya, 3-8,000 ft.
Simla on grassy slopes (Collett).

small, annual, slender, stem minutely bristly, often unbranched ; leaves $\frac{1}{2}$-$1\frac{1}{2}$ in. long, distant in pairs, narrowly lanceolate, short-pointed, rough, margins curved back, stipules bristly ; flowers scarlet, $\frac{1}{4}$ in. diam. axillary or terminal, solitary or 2-4 in small clusters, stalks short, lengthened in fruit, calyx teeth 4, very long, equal to the corolla tube, corolla tube $\frac{1}{8}$ in. long, lobes oblong, stamens 4 in the tube, style short, stigma 2-lobed ; capsule oblong or round, $\frac{1}{8}$-$\frac{1}{4}$ in. long, seeds many, angled.

**Anotis calycina,**
RUBIACEÆ.
F. B. I. ii. 73.
Himalaya, 3-7,000 ft.
Simla, Masuobra, (Collett).

small, annual, slender, smooth, stems tufted, 4-angled ; leaves $\frac{1}{4}$-1 by $\frac{1}{3}$-$\frac{1}{2}$ in., ovate or ovate-lanceolate, shortly stalked, long-pointed, stipules thin with short bristles on margins ; flowers small, white or lilac, axillary or terminal, solitary on slender stalks or 2-4 in a small cluster, calyx ovoid, teeth 4, minute, widely separated in fruit, corolla short, tubular, 4-lobed, stamens 4, nearly sessile at the mouth of the corolla tube, style slender, 2-branched projecting ; capsules in pairs, opening at the top by 2 valves, seeds many, minute.

**Spermacoce stricta,**
RUBIACEÆ.
F. B. I. ii. 200.
The Plains to 6,000 ft.
Valleys below Simla (Collett).

small, annual, stems and branches usually square, angles rough with curved-back prickles ; leaves 1-2 by $\frac{1}{6}$-$\frac{1}{2}$ in., linear or ovate, short-pointed, leathery, smooth or rough, margins turned down, stipules joined to the leaf stems forming a short tube with long marginal bristles ; flowers white, many in dense rounded axillary heads, bracteoles thread-like, longer than the calyx, calyx ovoid, teeth usually 4, linear, persistent, corolla funnel-shaped, 4 lobed, $\frac{1}{8}$ in. long, lobes linear, acute, stamens 4 on the throat of the corolla, style thread-like, stigma round ; capsule $\frac{1}{8}$ in. long, narrow at the base, thin, crowned with the calyx teeth, dividing into two one-seeded half fruits, seeds oblong, polished.

**Rubia tibetica,**

see Herbs, Erect, Opposite, Exstiplate, Simple.

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HERBS ERECT WITH OPPOSITE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

**Mollugo stricta,**
FICOIDEÆ.
F. B. I. ii. 663.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

small, annual, smooth, much branched; leaves $\frac{1}{2}$-$1\frac{1}{2}$ ins. long, narrowly lanceolate, nearly sessile, short-pointed, stipules membranous, soon falling off; flowers $\frac{1}{10}$ in. long, orange or pink, in many terminal branching clusters, sepals 5, $\frac{1}{16}$ in. long, distinct, persistent, petals none, stamens 3-5, styles 3, short, ununited; capsule round, within the persistent calyx, seeds many, dark-brown, rough with minute points.

**Pouzolzia indica,**
**P. pentandra,**
**P. hirta,**

see Prostrate Herbs, Opposite, Stipulate, Simple.

**Elatostemma pusillum,**

see Herbs, Alternate, Stipulate, Simple, Entire.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

**Bergia ammannioides,**
ELATINEÆ.
F. B. I. i. 251.
The Plains in wet places.

small, annual, smooth or slightly hairy, lower branches prostrate; leaves $\frac{1}{2}$-$\frac{3}{4}$ in. long, sessile, linear-lanceolate, short-pointed, sharply toothed; flowers $\frac{1}{12}$ in., sessile or nearly so, in dense clusters, sepals 5, lanceolate, toothed, petals 5, stamens 5; capsule 5-celled, valves brittle, edges turned in, seeds ovoid, many.

**Impatiens Roylei,**
GERANIACEÆ.
F. B. I. i. 468.
Himalaya, 6-8,000 ft.
Mahasu (Collett).
Changlagalli (Douie).

large, annual, smooth, stems succulent; leaves $2\frac{1}{2}$-6 ins. lanceolate, sharply toothed, teeth gland-tipped, long pointed, stalked, stipules of gland-tipped bristles; flowers $1\frac{1}{4}$-$1\frac{1}{2}$ ins. long minus the spur, pale pink in terminal racemes or clusters, sometimes branching racemes, sepals 3, 2 lateral minute greenish, one lower (lip) petal-like, coloured pink, cup-shaped prolonged into a hollow curved spur $\frac{1}{4}$ in. long, petals 3, one upper (standard) broad with a green tip between the two side lobes, two lower (wings) with lateral lobes, broad, notched on the margin with a little hollow at the base within, stamens 5, anthers cohering above the 5-toothed stigma with filaments clasping the ovary; capsule linear, club-shaped, beaked, nodding, 5-valved, the valves when

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HERBS ERECT WITH OPPOSITE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

ripe, if shaken, curl up elastically and jerk out the numerous large broad seeds.

**Impatiens Thomsoni,**
GERANIACEÆ.
F. B. I. i. 469.
Inner range of the Himalaya, 9-10,000 ft.

like the last species, but a little smaller, a little bristle-like gland between the teeth on the leaf margin, stipules of cushion-like tubercles, lateral sepals ovate-lanceolate, spur long, upper petal not lobed, capsule narrowly club-shaped.

**Impatiens sulcata,**
GERANIACEÆ.
F. B. I. i. 469.
Himalaya, 7-12,000 ft.
Simla Mahasu (Collett).

large, like *Impatiens Roylei*, but the stem grooved flowers darker pink or purple, capsule longer, less clubbed.

**Impatiens amplexicaulis,**
GERANIACEÆ.
F. B. I. i 469.
Himalaya, 6-12,000 ft.
Simla (Collett).

like *Impatiens Thomsoni*, but stem four-angled, upper leaves alternate sessile, stem clasping, lower leaves opposite, flowers fewer and smaller, capsule hardly clubbed, 1-1¼ ins. long.

PETALS NONE.

**Euphorbia hypericifolia,**
EUPHORBIACEÆ.
F. B. I. v. 249.
The Plains to 7,000 ft.
Simla (Collett).
Murree Valleys (Douie).

small, annual, slender, smooth, juice milky ; leaves ½-1 by ¼-½ in., shortly stalked, oblong, tip rounded, margins toothed except at the base, margins may be reddish, stipules minute, bristly, divided or none ; flowers minute in terminal or axillary clusters, often with two floral leaves at the base, 4 sepals or teeth 4 with 5 green glands in the angles, stamens several, surrounding a 3-angled ovary on a stalk hanging down on one side, styles 3, very short, branched ; capsule 3-lobed, velvety, splitting into 3 valves, one smooth seed in each cell.

**Euphorbia Emodi,**
EUPHORBIACEÆ.
F. B. I. v. 250
Himalaya, 4-7,500 ft.
Valleys below Simla (Collett.)
Kulu, Chamba, Lahoul.

small, annual, hairy, purplish, juice milky, branches straggling from the short stout stem ; leaves ¼-¾ in., in rather distant pairs, green with a purple blotch, oblong or linear-oblong, tip blunt, toothed-stipules fringed ; flower clusters, nearly sessile and solitary, $\frac{1}{16}$ in. long, like the last species but glands purple with white or rose colour ends, styles slender

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HERBS ERECT WITH OPPOSITE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS NONE.

capsule shortly stalked, smooth, slightly angled, seeds angled with slight projections.

**Euphorbia pilulifera,**
EUPHORBIACEÆ.
F. B. I. v. 250.
The Plains to 4,000 ft.
Valleys below
Simla (Collett).
Bhera (Douie).

small, annual, juice milky, stem and branches 1-2 ft., very hairy; leaves ¾-1½ ins. long, oblong-lanceolate, tip sharp, stalked, toothed, stipules minute linear; flower clusters $\frac{1}{30}$ in. many in terminal and axillary, sessile or stalked bunches, glands small, round; capsule $\frac{1}{24}$ in. diam., hairy, seeds ovoid, in other respects like the other species of Euphorbia.

**Euphorbia Clarkeana,**

see Herbs, Prostrade, Opposite, Stipulate, Simple.

**Urtica pilulifera,**
**The Roman Nettle,**
URTICACEÆ.
F. B. I. i. 548.
Himalaya, 5-7,000 ft.
Simla (Collett).

small, annual, covered with stinging hairs; leaves 1-3 ins. long, ovate, teeth very long, often linear, sharp-pointed, thin, stalked; flowers green, minute, male in slender branching spikes, female in round heads, both on the same plant, male sepals 4, concave, ovate, stamens 4, curled up in bud, straightening with a jerk when the flower opens, female sepals 4, flat, unequal, stigma of a small tuft of hairs; carpel held by the sepals, flattened. An introduced European weed found near houses.

**Urtica parviflora,**
URTICACEÆ.
F. B. I. v. 548.
Himalaya, 5-12,000 ft.
Simla (Collett).

medium size, root perennial, stem annual, slender but little branched, with blunt angles, covered with stinging hairs; leaves 2-4 by 1-2½ ins., ovate or lanceolate, long-pointed, wrinkled, teeth small, irregularly jagged, stalk ¼-2 ins. long, stipules united, ovate-oblong; flowers green, minute in slender spreading axillary and terminal branching pyramidal clusters, male and females on the same plant and like those of the last species.

**Urtica dioica,**
**The English Nettle,**
URTICACEÆ.
F. B. I. v. 548.
Salt range.
Himalaya, 7-10,000 ft.
Simla, Hattu (Collett).

like the last, but often stouter, stem grooved, teeth large, regular, stipules ununited, male and female flowers on separate plants.

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HERBS ERECT WITH OPPOSITE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED

PETALS NONE.

**Pilea peploides,**
URTICACEÆ.
F. B. I. v. 554.
Upper Himalaya, Lahoul.

small, stem and branches 3-5 ins., tufted, succulent, smooth ; leaves $\frac{1}{2}$-$\frac{3}{4}$ in. long, round, ovate, tip rounded, margin toothed above the middle, rarely smooth, 3-nerved, base wedge-shaped, stalk $\frac{1}{2}$-$\frac{3}{4}$ in. long, stipules minute ; flowers minute, green sessile in clusters on the slender branches of stalked spreading, axillary racemes 2-4 ins. long, male and female flowers on the same plant, male sepals 4, stamens 4, anthers white; female sepals 3, unequal, stigma of a tuft of hairs : carpel nearly round, minute, smooth.

**Pilea umbrosa,**
URTICACEÆ.
F. B. I. v. 556.
Himalaya, 4-9,000 ft.
Simla in shady places (Collett).

large, hairy, leaves 3-5 by 2-3$\frac{1}{2}$ ins., ovate, broadly toothed, base wedge-shaped, tip tail-like, sharp-pointed, stalk 1-3 ins., stipules nearly persistent, large ; flowers as in the last species, but dorsal female sepal much the longest, achenes minute $\frac{1}{30}$ in., pale, with a raised intramarginal ridge.

**Pilea scripta,**
URTICACEÆ.
F. B. I. v. 556.
Himalaya, 4-7,000 ft.
Simla, in shady places (Collett).

large, smooth, branched ; leaves 3-10 by 1-3 ins., lanceolate narrowed to both ends, tip tail-like, teeth small, shallow, stalk $\frac{1}{2}$-2 ins. long, stipules short ; flowers like the last species, carpels rough.

**Elatostemma sureulosum,**

see Herbs, Prostrate, Opposite, Stipulate, Simple.

HERBS ERECT WITH OPPOSITE STIPULATE LOBED LEAVES.

PETALS UNUNITED.

**Fagonia arabica or cretica,**
*Jowasa.*
ZYGOPHYLLACEÆ.
F. B. I. i. 425.
The Plains.
Common in fields.
Rawulpindi.

small, annual, green, spiny with glandular woody branches ; leaves small one to three lobed, leaflets linear, short pointed, stalk often leaf-like, stipules of two spines longer than the leaflets ; flowers pale rose-coloured, small on solitary stalks between the spines, sepals 5, soon falling off, oblong-lanceolate, half the length of the petals, petals 5, closed, soon falling off, stamens 10, style and stigma undivided ; capsule velvety, 5-cornered, 5-celled, two seeds in each cell.

**Fagonia Bruguieri,**

see Herbs, Prostrate, Opposite, Stipulate, Simple.

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HERBS ERECT WITH OPPOSITE STIPULATE LOBED LEAVES.

PETALS UNUNITED.

**Geranium pratense, Cranes Bill,**
GERANIACEÆ.
F. B. I. i. 429.
Kashmir, 7-10,000 ft.
The Chor near Simla.

medium size, stout, rootstock perennial, joints swollen, hairs spreading ; leaves 2-3 ins. diam., sometimes alternate, round, cut into 7-9 segments, short-pointed, stalks long, stipules small, lanceolate ; flowers 1½-2 ins. diam., blue-purple in pairs on axillary bracteate glandular and hairy stalks, sepals 5, long-tipped, petals 5, stalked, alternate with 5 glands, spreading, stamens 10, 5 long alternating with 5 short, filaments flattened, narrowed upwards, united below, styles 5 ; capsule 5-lobed and-celled, cells one-seeded, the capsule and styles elongate, the styles curl up with a jerk, ejecting the seeds.

**Geranium rectum,**
GERANIACEÆ.
F. B. I. i. 429.
Kashmir.

medium size, rootstock stout, perennial, stem slender, slightly hairy and leafy ; leaves 3-4 ins. diam., 5-angled, 7-lobed, divided to below the middle, lobes sharp-pointed, thin, slightly hairy on both surfaces, long-stalked, stipules lanceolate ; flowers 1¼ in. diam. on long stalks, bracts awl-shaped ; the other characters are like those of the last species.

**Geranium collinum,**
GERANIACEÆ.
F. B. I. i. 429.
Kashmir.

small, woolly or glandular-velvety, stems many unbranched, flowering 6-10 ins. high ; leaves sometimes alternate, round, 5-7-lobed to below the middle, segments wedge-shaped, blunt, 3-5 lobed, stipules small, ovate, short-pointed, flowers and capsule like *G. pratense* above.

**Geranium palustre, or grandiflorum,**
GERANIACEÆ.
F. B. I. i. 430.
Kashmir.

very like the last species, but taller with large flowers 2 ins. diam. ; leaves 5-angled with 5 lobes cut pinnately.

**Geranium Wallichianum,**
GERANIACEÆ.
F. B. I. i. 430.
Himalaya, 7-11,000 ft.
Simla (Collett).
Murree (Douie).
Hazara (Barrett).

large, perennial, hairy, root thick, stem stout much branched ; leaves 3-4 ins. broad, 5-angled, deeply 3-5 lobed, segments long-pointed, sharply toothed, stalked, stipules ½-1 in. long, very broad, blunt ; flowers blue purple, 1½-2 ins. diam., on long stalks, bracts large, sepals 5, ending in a long bristle, petals 5, tip broad with a shallow notch, stamens, styles and capsule like *G. pratense* above.

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HERBS ERECT WITH OPPOSITE STIPULATE LOBED LEAVES.

PETALS UNUNITED.

**Geranium Tuberaria,**
GERANIACEÆ.
F. B. I. i. 431.
Kashmir.

medium size, slender, hairy and glandular, root tuberous, perennial ; leaves 1½-3 ins. diam., sometimes alternate, round kidney-shaped, divided into 5-7 parts, segments very spreading, much divided, redical leaves long-stalked, stipules variable ; flowers 1 in. diam. in nearly umbelled clusters of 2 surrounded with shortly stalked leaves, main flower stalk very hairy and glandular, bracts leafy, much divided, sepals 5, small, blunt with a fine abrupt point, petals 5, large, rounded with a notch, stamens 5, filaments slender ; capsule 1¼-1½ ins. long, erect, hairy, styles very short, the beaks do not separate as in other species.

**Geranium Robertianum, Herb Robert,**
GERANIACEÆ.
F. B. I. i. 432.
Himalaya, 6-8,000 ft.
Kashmir, Narkanda (Collett).
Murree (Douie).

medium size, annual or biennial, softly hairy, usually glandular and strongly scented, often red, stem 1-2 ft. high, succulent ; leaves 1-3 ins. broad, triangular oblong, cut to the base into 3-5 pinnately lobed segments, central segment longest, lobes short-pointed, stalk long, stipules ovate, ¼ in. long ; flowers ½ in. diam., red pink streaked with white in two flowered clusters on long stalks, sepals 5, broad, long-pointed, petals 5, narrow, smoothly stalked, twice as long as the sepals, not notched, stamens 5 ; capsule ¾-1 in. long, beaks separating upwards and attached above by silky hairs.

**Erodium ciconium,**
GERANIACEÆ.
F. B. I. i. 434.
N.-W. Frontier Province, Kohat.

small, annual, velvety and sticky, branches stout, swollen at the joints ; leaves ovate, cut into two or three segments, segments divided into small toothed lobes, stipules ovate-lanceolate, long-pointed, thin, dry ; flowers small, purple on long two-to many flowered stalks, bracts thin, dry, finely hairy with an abrupt point, sepals 5, ovate thin with 3 glandular hairy nerves, ending in a long bristle-like point, petals 5, alternating with glands, broad at the tip, stamens 5, alternating with 5 staminodes, in other characters like *Geranium pratense* except the beaks being pitted at the top and the styles silky on the inner surface.

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HERBS ERECT WITH OPPOSITE STIPULATE LOBED LEAVES.

PETALS UNUNITED.

**Erodium malacoides,** GERANIACEÆ. F. B. I. i. 435. The Plains. Attock, Peshawaur, Hazara (Stewart.) Rawulpindi. Kot Fateh Khan (Douie).

small, annual, softly hairy, stem erect or widely spreading ; leaves ovate oblong, blunt or sharp-pointed, velvety, cut into three lobes only, not again subdivided, stipules large, thin, dry, blunt or sharp-pointed ; flowers small, lilac on three-to many flowered stalks, bracts ovate, thin, dry, finely hairy, sepals 5, thin, two outer 5-and three inner 3-nerved, the bristle point hairy, petals 5, tip broad, 9-nerved, stamens 5 with 5 staminodes ; carpels stalked, 3-angled, beaks 4-5 times as long as the cell, with stiff brown hairs for $\frac{1}{4}$ of its length, pits on beaks with a deep fold.

**Cannabis sativa,** see Herbs, Erect, Alternate, Stipulate, Lobed.

(*To be continued.*)

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# REVIEW.

## THE RHOPALOCERA OF JAVA (*PIERIDÆ*).

BY

M. C. PIEPERS AND P. C. T. SNELLEN.

This volume is the first of a projected series; it is based on the work of the first author, an official in Java, who collected there for many years.

The authors have apparently used English as their medium, without having a sufficient acquaintance with it; sentences framed in German or Dutch and rendered imperfectly into English, make text which is not clear and the proof-correcting has been very imperfectly done. The introduction deals with certain biological subjects; the author states clearly that he is a determined opponent of the mimicry theory, that the phenomenon of evolutionary atrophy in *Lepidoptera* is neglected, that what he calls colour evolution proves the last statement, that the usual conception of dry and wet season forms is erroneous and finally that the hindwings of butterflies are disappearing in the process of evolutionary atrophy He refers to the varying development of the anal horn of *Sphingidæ*; stating his belief that it is in process of disappearance by evolutionary atrophy, equally he believes the prothoracic wings of some insects have existed and disappeared, that in *Rhopalocera* the fore-legs are going, that the hindwings are getting smaller, "while, probably by correlative influence", the size of the fore-wings and the "whole corporal size of the Rhopalocera is strongly diminishing." Finally the pigments of the wings of Rhopalocera are paling and there is a tendency to the production of more black scales and so a darkening of the whole wings. The author expresses strong opinions in regard to the late de Nicéville's views on wet and dry season forms and mentions "the wild exaggeration of now-a-days in this respect". To most Entomologists, the author's opinions, backed by no definite observations or research, will carry little weight and the value of the work is not increased by the discursive introduction in which such novel views are put forth, an expression apparently of the author's peculiar point of view.

A total of 33 Pierids are listed as from Java and the author brings together the recorded facts as to life-histories. It is perhaps typical of modern entomology that the authors cannot accept the usual generic or specific designations and that to use the volume one must first look up the synonymy and ascertain what species, as generally known, they are discussing. The genus *Leptosia* becomes *Xiphia*, *Pieris* includes species from *Huphina*, *Appias* and *Saletara* of the Fauna of India; the genus *Delias* becomes *Thyca*; the last is due to Snellen, with whom Piepers is apparently not in sympathy as he states "This genus is generally called *Delias*. But Mr. Snellen is of opinion that the systematist need not count with the names given by Hübner ° ° ." If entomologists who publish such works would agree, all could use them with ease, but at present one has first to correlate the

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synonymy, no light task, before one can understand what species really are being discussed. *Iphias* is what the Fauna of India calls *Hebomoia*, *Callidryas* is our *Catopsilia* and so on.

For the student of Indian entomology, the work is of interest on account of its biological observations but the author's hostility to de Nicéville tinges it too strongly not to give rise to a feeling of distrust.

There are four beautiful coloured plates, in which larvæ, pupæ and butterflies not hitherto figured are beautifully portrayed. The authors have designedly given forth this family as a "proof" or model of what the whole series will be, in the hope of obtaining financial support. We fear the author's peculiar views and confusing nomenclature will make the series rank with other similar publications of great size and cost, which do little but add entries to cumbersome literature references without assisting towards a greater knowledge of the subject.

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# MISCELLANEOUS NOTES.

## No. I.—NEW LANGURS FROM THE INDIAN EMPIRE.

In the Annals and Magazine of Natural History, Vol. 4, ser. 8th, September 1909, Dr. D. G. Elliot in a paper on "Descriptions of apparently new species and sub-species of Monkeys of the genera *Callicebus, Lagothrix, Papio, Pithecus, Cercopithecus, Erythrocebus* and *Presbytis*" describes three new species of Langurs from within our limits:—

(1) *Presbytis melamera* obtained at Cadu Gaung, Bhamo, N. Burma, collected by L. Fea.

(2) *Presbytis crepuscula* from Mooleyit, British Burma.

(3) *Presbytis lania*, shot in the Chumbi Valley, Tibet, by Lt. F. Bailey and presented by the Bo. Nat. Hist. Society to the British Museum.

The types of the above are all in the British Museum.

## No. II.—ON THE FOOD OF THE DESERT GERBILLE (*GERBILLUS HURRIANÆ.*)

In the *Fauna of British India* (Mammalia) Dr. Blanford remarks that the Indian Desert Gerbille (*Gerbillus hurrianæ*) "abounds in sandy desert or semi-desert, and is particularly common in Sind" and "it is commonly seen out in the day, in the cold season at all events, and is by no means shy." There is plenty of such country round Karachi, and it is very pretty to watch these attractive little field rats round their burrows. Their diurnal expeditions are however by no means confined to the cold season, as they are out and about the whole year round, and on the absence of shyness, I can more than confirm Dr. Blanford's remark, in fact I would go so far as to describe them as bold. Watching a community of them this morning from behind a bush at some fifteen yards distance, I walked boldly forward into the open to investigate a wasp that was circling round some plants near them. There was naturally a sudden disappearance of the gerbilles, but as I approched, the heads and shoulders of two appeared again at the mouth of a hole not three yards before me. I stopped, and they shewed no signs of alarm, for they—a mother and half-grown young one—proceeded to fondle each other, licking one another's faces in the most affectionate manner. On returning towards the bush I turned and sat down in the open, not ten yards from the burrows, and as I did so there were already half a dozen of them outside their holes. One cannot help admiring one's jungle friends in such close proximity, but in doing so one is liable to receive bitter shocks to one's feelings. On this occasion one was in store for me, for I saw a full-grown gerbille scuttle away some distance and return with a large lump of some dark stuff in its mouth. I had seen where he had gone for it and went up to ascertain its nature. It proved to be a dry piece of human excrement! I again returned to my post of observation; in a few moments the gerbille reappeared and proceeded to demolish his unsavoury meal. We must always be prepared to modify our opinions when we come to

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pry into the inner life of wild animals, but the process of doing so does not always add to our respect for our jungle friends.

E. COMBER.

KARACHI, 15*th August* 1909.

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### No. III.—TIGER ATTACKING A BEAR.

I do not ever remember to have heard of a Tiger attacking a Bear, until last cold weather, when shooting in the Central Provinces. When making inquiries of an old *Karmar*, who spent his life in fishing and hunting, regarding the game to be found in the district, he casually remarked that a lame bear used to frequent a certain part of the jungle, but that it had quite recently been killed and eaten by a tiger. He was quite positive of the fact—in support of which he advanced the evidence that he found the partially devoured remains of the bear in the bed of the river and the sand showed ample evidence of there having been a fierce struggle between it and a tiger which in the end had come off victorious and made a meal off his foe ! A few days afterwards when passing the spot he pointed out some of the bear's hairs lying scattered about the place—the carcase having been cleared away by animals. He said the bear was a large one, but for a long time past—for he had often seen it in the neighbourhood—he had noticed that it was lame. I had no reason for doubting the man's words, but the incident was certainly a very unusual one.

L. L. FENTON, LT.-COL.

4*th October* 1909.

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### No. IV.—A FIGHT BETWEEN A HYÆNA AND A PANTHER.

"In March 1908, a party of Royal Artillery Officers from Secunderabad had a drive for tiger in the Mahadapore Taluka in His Highness the Nizam's Dominions near the village of Somnapally some 16 miles off the Godavery. A tiger came out first and was bagged, shortly afterwards a panther came out and received a flesh wound in the neck, after which it disappeared into a deep cave. This was surrounded; and they soon heard the noise of a fight going on inside spelling fighting, roaring, etc. The shikaries said that there was a tiger in the cave which was killing the panther ; the officers tried for half an hour to dislodge the animals by firing rifles and throwing fireworks into the cave but without success. So leaving the officer who had wounded the panther on guard, the other two went off to secure the dead tiger. Shortly afterwards a small hyæna came out and was shot. The hyæna was a female about 4 feet 6 inches in length and was somewhat badly scratched about the face but otherwise uninjured. Next morning on returning to the cave a female panther, about 5 feet 10 inches, was found lying just outside the cave stone dead. On examination it was found that she had a flesh bullet wound in the neck, which was not sufficient to kill her, but she had been bitten in two places by the hyæna, firstly through the loins, secondly through the kidneys and at the same time injuring the spine, and there is little doubt that the panther died from these

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injuries as the flesh wound in the neck was not nearly severe enough to cause its death, although it might have done so in a few days if mortification had set in."

The above gives us some reason to doubt if the gentlemen, one reads of who pull hyænas out of caves by the hind legs, were not luckier than they knew.

W. M. F. PENDELBURY.

JALNA, 26*th October* 1909.

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## No. V.—MOTTLED POLECAT (*PUTORIUS SARMATICUS*) AT BANNU.

An example of the Mottled Polecat (*Putorius sarmaticus*) was recently sent me by Mr. Harris, Assistant Commissioner and Political Agent, Bannu. It had been caught by Bannuchi Zemindars about three miles from Bannu in sugar-cane crops.

Mr. Harris informs me that this is the second example brought to him by the natives, the first having been caught in a desert tract under the hills; so the species is, possibly, not very rare in this district.

The one sent me I now have in captivity. It does not appear to be quite up to the measurements given in the "Fauna," and may be an immature specimen. It differs from the "Fauna's" description in having the muzzle and chin white and the back of the head and nape a brownish white.

In habits it is sluggish and disposed to sleep all day, but at night becomes active, running up and down its cage and tearing at the wire netting with teeth and claws. When suddenly disturbed, by day, it becomes savage and utters a growling noise, very similar to that of a fox-terrier pup of a few weeks old when irritated.

It thrives on raw meat and milk, and dead birds are especially appreciated being devoured bones and all. A live quail introduced into its cage, by day, was not touched; in fact, if anything, it appeared afraid of the intruder. I have not yet been able to secure a live rat with which to further test its killing propensities.

H. A. F. MAGRATH, MAJOR.

BANNU, *September* 1909.

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## No. VI.—A GOOD HEAD OF HODGSON'S WILD SHEEP.

(*With a Plate.*)

I send you a photograph of the head of an *Ovis ammon hodgsoni* which was shot at Dochen in Tibet in July 1907. The following are the measurements of the horns:—

| Length. | | Circumference. | |
|---|---|---|---|
| Right. | Left. | Right. | Left. |
| 48½" | 49" | 19" | 19" |

F. M. BAILEY.

GYANTSE TIBET, *April* 1909.

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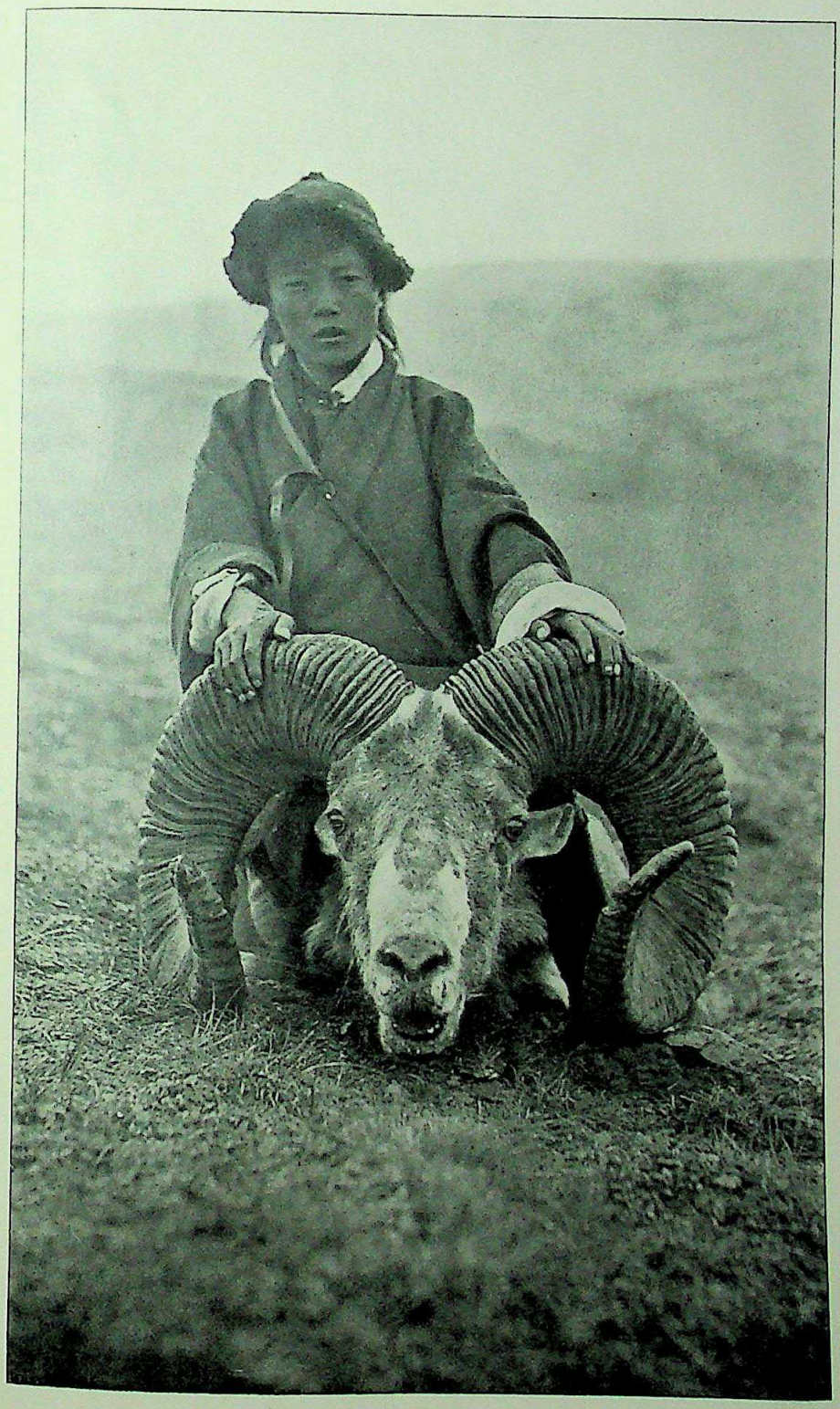

HEAD OF *Ovis ammon*.

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## No. VII.—THE SEROW.

I see in our journal, Vol. XIX, No. 2, on page 519, among the Miscellaneous Notes, one (No. IV) by H. Shaw Dunn on Serow.

He says he does not think that the rufous variety exists in Upper Burma. Allow me to assure him that he is absolutely wrong, in fact I believe the rufous variety is the only variety which exists in the Upper Chindwin.

I shot a Serow within 4 miles of Teslin in the Gangaw Sub-division—an old male—rufous-red all over except for a black mane and tail and a black line running along the length of his back. Also two some 60 miles further north, one on the Nwaydoung—rufous-red—being a female the line along the back not black but only a darker colour than the rest of the body, and one 10 miles from here, a small male of the same colour as the first above described.

I saw a Serow killed by wild dogs in the Lomegtoung, also one killed in the same way some 140 miles north in the Mytha river and not more than 20 miles from Kalewa. Both were rufous-red, and you could no more have called them black than you could white.

I had one of those I shot set up (head and neck) and I fancy Mr. Dunn would alter his opinion were he, at any time, to pay a visit to Spencer House, Stansted, Essex, where the head is now and where it would be shown him with pleasure.

I am well aware that the black variety exists in most parts of Upper Burma, and I believe it is the only variety in the Ruby Mines; but that the rufous variety also exists, there is no doubt. I saw a specimen of the black in Mogok, set up head and neck, and could not at first believe it was shot in Burma, so much did it differ from those I had seen and shot.

C. B. MOGGRIDGE,
Ruby Mines District.

MANDALAY, *November 2nd*, 1909.

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## No. VIII.—HABITS OF THE TAKIN.

In connection with the recent arrival of the young Bhutan Takin in the Zoological Society's Gardens, the following notes on its Chinese cousin, taken from a letter written to me from Chentu, Sze-chuen, on 9th October 1908, by the late Mr. J. W. Brooke, will be of interest, as very little has been previously recorded regarding the wild life of these curious ruminants. After referring to the great difficulty of approaching the animal, the writer states that in Sze-chuen the Takin inhabits dense bamboo and rhododendron jungle on extremely precipitous hillsides, where it is nearly always pouring with rain. The elevation of these jungles is from 8,000 feet to 10,000 feet above sea level, and here the males are to be found from October to May, except when driven down by stress of weather. The females, on the other hand, descend to the valleys during March, April and May to feed and rear their young. These are suckled only for a fortnight after birth and very speedily become as active as their parents, as is evident from their tracks, which may be seen in the most

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precipitous situations. So steep, indeed, is the ground on which Takin of all ages are usually found that Mr. Brooke was of opinion that they must aid their ascent by hooking on to the rhododendron branches with their horns as he could not otherwise imagine how they negotiated the smooth, steep places on which their tracks may be seen. This, however, requires confirmation by actual observation before it can be definitely accepted.

Takin go about, says my correspondent, in herds of from five to about fifty head, and, according to the reports of native hunters, when a herd takes to headlong flight all its members will follow the line of their leader, who may even leap over a precipice. Old males are stated to attain a huge size, Mr. Brooke mentioning that some of the tracks of their great clumsy hoofs are 6 in. square. For a considerable part of the year they separate themselves from the main herds which consist of females and young males. Here it may be mentioned that information supplied to me by Capt. Malcolm McNeill confirms the conclusion reached from the study of the specimens in the British Museum that young females are much greyer than males of the same age.

The best time to shoot Takin, observes Mr. Brooke, is in winter, when the heavy snow compels them to come down to the valleys ; but as the snow is soon melted by the warm winds blowing from the plains, they are only to be found low down during unusually long and heavy snowfalls. Throughout the winter they will always be found on the wander, as if never contented with a single grazing ground ; and if not found low down in the valleys are almost impossible to hunt successfully. It will be observed that nothing is said by my correspondent as to the whereabouts of the Takin from May till October, but I presume that Mr. Brooke referred only to the period during which he was on the ground, and that, except for the aforesaid temporary descents, they haunt the bamboo and rhododendron jungle throughout the year, unless it be that they go still higher in summer.

As regards the young Bhutan male in the Regent's Park Zoological Gardens the straightness of its horns gives it a much greater resemblance to a Serow than is presented by older animals, when the horns have acquired their characteristic curvature. With its conspicuous broad dark dorsal stripe, the animal looks, indeed, by no means unlike a light coloured "sport" of the Nepaulese race of the Sumatran Serow ; and I have little doubt that the two animals are nearly allied. In its present condition, at any rate, the colour of the coat of the Bhutan animal is very different from that of either the male or female of the older pair of the Sze-chuen species exhibited in the lower mammal gallery of the Natural History Museum.

R.

(*From "The Field"* of 31*st July* 1909.)

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## No. IX.—A GOOD CHINKARA OR INDIAN GAZELLE HEAD.

In May 1909, Captain J. Hodgkinson, 5th Cavalry, shot a Chinkara, (*Gazella bennetti*) near Montgomery, Punjab, with horns measuring 15¼ inches in length

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and 5 inches in girth. The horns were measured by myself with a steel tape while still fresh and in the hands of a taxidermist in Meerut. I have not heard of any Chinkara head larger than this and doubt if such has been obtained.

R. M. BURTON, MAJOR, I.A.

MEERUT, 11*th September* 1909.

[According to Rowland Ward's *Records of Big Game* the record Indian Gazelle head measures 15⅝ with a circumference of 4¾ inches. It belongs to Major P. C. Pain. Another head of the same length but half an inch smaller in girth was killed at Ferozepore and is in the Mess of the 14th Sikhs.—EDITORS.]

## No. X.—THE WALL CREEPER (*TICHODROMA MURARIA*) IN LYALLPUR.

I am sending a bird I shot last weather in this district (Lyallpur) for identification. I first saw it in June at this place, Kotkhudayar. It spent its time flying round the buildings here, which are all of bricks, and clinging to the sides of the walls where it seemed quite at home. It was alone and made a plaintive cheeping noise which was repeated at intervals throughout the day. I saw it at this bungalow for about four days when it disappeared. About three or four days later I had occasion to go to a bungalow of mine which is about 18 miles from here when I saw the same bird again. At least I believe it must have been the same. I shot it and have kept its skin. I have not seen any more here since. If the skin is of any use to the Society you may keep it.

A. B. AITKEN.

KOTKHUDAYAR P. O.,
*Via* CHUNOT ROAD, *August* 18*th*, 1909.

[The bird sent is a Wall Creeper (*Tichodroma muraria*) and has not often been found so far south in India before. As a rule this species keeps to the hills and only descends to the plains during the cold weather. In India this species is found throughout the Himalayas and the hills of the frontier and has been recorded during the cold weather from Etawah, Bhutan, Doars and Dehra.—EDITORS.]

## No. XI.—SEASONAL CHANGE OF PLUMAGE OF THE INDIAN WHITE-EYE.

In May 1901 I caught a White-eye (*Zosterops palpebrosa*) which was visiting my newly-built aviary to talk with some tame White-eyes I had. He had a bright chestnut forehead. I did not think much of it at the time as I did not then well know this bird from a book point of view, though well acquainted with it alive both wild and in captivity. He died soon. Not long after, I looked up the book and was astonished to find no mention of a chestnut-foreheaded White-eye nor of a seasonal change of plumage. Till this year (1909) no other similarly coloured ones have been observed by me, though I must confess that I did not particularly look out for them and that in some years I had no opportunity of observing White-eyes at all.



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About mid-April this year I noticed several with chestnut foreheads, and pointed this out to my bird friends in the Regiment, Major Sealy, a very keen observer and field naturalist and Mr. Kennedy a fellow aviculturist. Wanting a couple of pairs for my aviary I set a "drop-net" near a flowering shrub the birds visited and soon had a bird. I was rather disappointed to find the forehead only rusty coloured. I put it down as a hen, correct but a fluke. Her mate (or rather a mate) was caught the next day, and he had a fine chestnut forehead. The hen died at once; it is a bad season to "moult off" in and I determined to wait for others till autumn if the cock died. He did not die, so about 1st May I set the net again and caught ten in under two hours and could have caught more. All these and the others flying about uncaught had bright chestnut foreheads. In fact about this time I saw none that were not coloured in this way. In plumage the sexes were indistinguishable, but I found that I had five pairs. With the aid of a four-compartment wire cage I separated out two true pairs and let go the rest. I am pretty certain that these birds had not then started nesting, though there were several nests lower in the station.

I left the station to go further up the hill where there are no White-eyes, on 26th May; by that time I noticed my White-eyes were losing their chestnut. I returned on 6th June. Mine had lost all colour, and the wild ones I saw had lost theirs, but Major Sealy told me that he had lately seen some "coloured" ones about. I went up the hill again on the 8th June, returning on the 20th June. I made a special search for coloured ones without success. A few days later Mr. Kennedy showed me a nest with young in his compound; we watched the old birds feeding the young from a very short distance. They were normally coloured.

My five are as fit and as happy as their wild relations, but they remain common or garden Indian White-eyes (*Zosterops palpebrosa*) and charming as they are, of no special interest to any one but myself. Still I have hopes that they will attempt breeding next year.

Of course, I know that to make a good record one ought to kill and send down a skin. I plead laziness with a dash of sentiment. I make the record such as it is, as several things strike me as curious about it. The bird is a very common one, why has such a change not been recorded before? I believe it has not been recorded. How was it that I noticed it in 1901 and then not again till 1909? I certainly did not keep a special look-out for it; but the chestnut is very noticeable and I set to work to catch my 1901 bird on that account. Both sexes don the chestnut, but keep it such a short time. Men (and women) have been known to drop fine raiment soon after matrimony. Can one apply a similar reasoning? Is it a species in the making?

G. A. PERREAU, Capt., F.Z.S.,
4th Gurkha Rifles.

Bakloh, Punjab, *8th August* 1909.

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## No. XII.—SHRIKES' LARDERS.

On page 529 of Volume XIX of the Society's Journal, the writer, who reviews "Birds of the Plains," charges me with casting doubt on "the well-recognised habit of the shrikes of storing their captures impaled on the thorns of bushes." He says that it is a pity I ridicule "such previously undisputed evidence." Finally he says "It is quite probable that some of the smaller shrikes have not the habit of impaling their victims in this manner, but the remarks (in 'Birds of the Plains'), are generalised for the whole family." Was ever a writer more misrepresented than I have been? What I did, and do, say is that I have never set eyes upon such a larder, nor have I seen a shrike impale a victim. On the strength of this I added "I, therefore, think I am justified in suggesting that the habit of keeping a larder is probably restricted to the larger species of shrike." I further stated that I would esteem it a great favour if any one, who has seen a larder, would favour me with an account of it. Yet again, I said "Let me not be mistaken. I do not say that butcher birds never keep larders, for they undoubtedly do; of this I am satisfied."

But let this misrepresentation pass. The important point is the larder. The reviewer above referred to says that he has come across one. I am sure that most of the readers of this Journal would like to have an account of it, to be told in what part of the world it was found, to what species of shrike it belonged, what was the nature of the meat stored therein, whether, as the store of meat began to run low, it was replenished. I have never read an account of such larders in India, so that I hope that those members of the Society who have seen them will come forward. Owing to the ubiquity of crows and ants in this country, I should imagine that the butcher bird, that attempted to set up "shop," would find its hands pretty full in keeping its stock intact. I should be very glad to hear how the shrikes in question overcame the difficulty.

D. DEWAR.

ALLAHABAD, *6th December* 1909.

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## No. XIII.—COMMON MYNA (*A. TRISTIS*) FEEDING YOUNG OF PIED MYNA (*S. CONTRA*) AND NESTING HABITS OF THE COMMON PARIAH KITE (*M. GOVINDA*) AND BRAHMINY KITE (*H. INDUS*).

The other day I saw a common brown myna feeding the young of the pied kind. A friend of mine also sent me the following interesting note some time back. Have you ever noticed that the ordinary kite—the brown one—picks up sticks from the ground to make a nest, whereas the Brahminy kite pulls them off the growing tree, so the sticks he uses are much smaller than those used by the other?

CHAS. M. INGLIS.

BAGHONIE FACTORY,

LAHERIA SERAI, P. O., *5th November* 1909.

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## No. XIV.—CHANGE OF PLUMAGE OF THE CINNAMON TREE-SPARROW (*PASSER CINNAMOMEUS*).

I met this bird first in Chitral (1902-03), but only took skins in winter. Captain Fulton's were also winter skins. All mine were normal. In June 1906, I met this bird again in Kajiar, a little up in the hills in Chamba, one March, beyond Dalhousie. I put it down as *cinnamomeus* without considering the matter much.

In June 1907, I was trapping in Kajiar with a view to collecting birds to take home alive with me the following March. There were Cinnamon Tree-Sparrows in abundance, but to my disappointment I could see none with any signs of yellow on them, though there were numerous colonies nesting. I took away three nestlings, which turned out one cock and two hens, and an adult cock. They showed no trace of yellow. The adult cock had a fully developed bib and the back and head were a fine cinnamon; so it could not have been a bird of the year. The young take some time to reach this stage; my young cock had not attained this plumage fully when he died in March 1908. I certainly should have reported the occurrence of *P. rutilans* (or *assimilis*) but that I could get no skins. Since then I have learnt to mistrust my skin-procuring propensity.

Careful record was not kept of change of plumage, but by December 1907 all four birds "showed yellow" and bright at that. They were undoubted Cinnamons. Had the Kajiar birds showed even a far duller yellow I could not have helped noticing it, as I watched them pretty carefully. The yellow was duller by March 1908 and it was duller still when they went to Mr. Teschemaker in England in May.

The above is a summary of a paper by me in the Avicultural Magazine, Vol. VII, May number, 1909. In the same number, Mr. Teschemaker wrote a paper on the successful breeding in captivity of this species. I give extracts, taking only those which concern change of colour, about which I made mention to him before sending him the birds.

"Now, of course, I was anxious to put this matter to the test, and, as yellow is a colour not easily impaired by cage-life, I did not anticipate any difficulty in the matter, and only retained the young male for the purpose of observation."

"The adult male began to show his yellow breast about the middle of December, apparently through an actual change of colour and not by casting any feathers, and as an exhibitor offered to purchase a pair, and naturally wanted the best birds, I sent him this bird. As bad luck would have it it died shortly after arrival, and with considerable reluctance, I therefore gave him the remaining young male. I am unfortunately therefore only able to confirm Captain Perreau's observation to this extent: namely, that the adult male certainly had a bright yellow breast when I received it on the 4th May (though it had faded somewhat according to Captain Perreau, by that date); that by the commencement of July it's breast had become entirely grey, only

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the cheeks retaining the chrome colour; that by the middle of December there was every indication that the plumage of the former winter would be renewed. On the other hand, Captain Perreau tells us that the young male (which was ultimately killed by the adult male) also changed colour in December, and this I cannot confirm because I have made careful enquiries and, as lately as the 31st March it's present owner has informed me that there is no indication of any change."

"I am hoping that this matter may still be cleared up beyond any possibility of doubt, because Captain Perreau has just returned to India and will be able to obtain a series of skins, and on the other hand, I hope to be able to keep an eye on the birds which were bred in my aviary and record any change."

I hope he has been more successful with his records than I with my skins. As to my young bird, I find the following note about it's decease:—"Found dead in a box, probably worried by old cock, no mistake as to which it is, little yellow showing bib not quite developed, back and head less so."

He also gives the size of the eggs as being 72 mm. by 53 mm., and mentions the female "with her yellow cheeks and richly coloured and striated wings."

Cinnamons do not visit us here even in winter, worse luck, we get *P. domesticus*, var. *ind.* instead, and he seems to increase every year. I spent two "ten-days" further up the hill this year. I got no skins. I plead laziness with extenuating circumstances. At the first place they were rare and only met with when they were safe. There was no yellow on those I saw. In the second place (Kajiar) they were extremely common but—there was a "week" on. Afternoons and evenings were occupied and I rather begrudged giving up even a part of my mornings to skinning. Also a gun attracts more attention than a couple of "dropnets" and a small spring-net. I had not meant to do any trapping at all, but was rather glad to find the mornings free and still more glad that I had the above nets, not that they did much good for what I specially desired, *i.e.*, black and yellow Grosbeaks and Cinnamons. I spent three mornings at the latter in a place that had been used by transport mules at the start of the "Camp," and which simply swarmed with these sparrows. They were uncommonly cheeky and tame, but would have nothing to do with my nets. I saw only two with yellow, old cocks, both had nests close with young. They were practically in sight all the time; the yellow was not over bright and was confined to the cheeks or may be sides of the neck. I saw hens (and cocks too for that matter), feeding young at a distance that any yellow even of the palest ashy would have been easily discernible even without glasses.

I met with a few in Dalhousie on the way through, some with nests in the houses I visited No yellow except on one cock, which was coloured like the Kajiar yellow cocks.

Oates describes the hen as having the whole lower plumage pale ashy yellow. He describes the cock of *P. rutilans* as only differing from that of *P. cinnamomeus* in having "the cheeks and ear-coverts pure white and the

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lower plumage ashy-white without a trace of yellow." He continues "the females of the two species are indistinguishable."

In my birds the ear-coverts and cheeks of the cocks "out of colour" were ashy white rather than pure white and the lower plumage of the hens (especially the upper parts of it if I remember rightly) deserved (when in colour) a higher attribute to the yellow than pale ashy. I have a kind of recollection that my Chitral hens were distinctly yellow underneath, but one cannot count much on memory for so many years back, unless the reminiscence is backed by some special reason. Bright "reds" in the cock often find their counterpart in yellows in the hen, but surely it seems curious (with passerine birds) that such a dingy colour as ashy grey (in the cock) should be replaced by pale ashy yellow (in the hen). I own to not having seen *P. rutilans*, alive or dead.

This is a good deal longer than I intended, but I hope that colour theorists at any rate will find something of interest in it.

G. A. PERREAU, Capt., F.Z.S.

Bakloh, Punjab, 30*th August* 1909.

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## No. XV—THE NESTING OF A FEW SOMEWHAT RARE BIRDS NEAR MHOW.

The Indian Pitta (*Pitta brachyura*)—When going down the ghats, near Mhow, in July 1908, I came on this beautiful bird. I knew, therefore, it must be breeding and I determined to find its nest. I had an idea that this was located low down in brushwood. It was not, however, till June 1909, that I proved successful My happy hunting ground is a bit of level ground, very glade like in appearance, at the bottom of the ghats, *viz.*, tallish trees, slight undergrowth but not sufficient to impede one's view early in the monsoon, but later very rank and thick. The Pitta is a very shy bird and does not give one much time to watch him. I knew there were a certain number in this particular locality, as I had seen them flitting about, but how many pairs there were I never could settle.

My method of birds' nesting is to mark down the nests while being built. I know more or less when the season of the various birds come round. I then watch them. If nesting one very soon spots it by watching, it is not long before the nest is betrayed. I have pursued this system with marked success. The great advantage of it is that one gets fresh clutches.

It was my intention to follow this practice with the Pittas. I visited my happy hunting ground on two consecutive Sundays early in June, and met with success. On these occasions, I left the Pittas alone, as I fancied they did not breed till July. On the 27th June, having collected eggs from several nests, marked down the previous Sunday, I turned my attention to the Pitta, and told my orderly, who accompanied me to keep a sharp look-out. I had not proceeded very far when I saw an untidy mass of twigs on the fork of a teak

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tree, with absolutely no concealment, about 12 feet off the ground. I did not think much about it, but as it was so accessible, I told my orderly to go up and investigate. To my intense pleasure and surprise, as he began to climb, out flew a Pitta, and my search was rewarded. The nest contained 6 partially-incubated eggs. I had the nest taken down and examined it. First, a mass of sticks is collected forming a foundation, on this the nest proper is built up. It is compact and domed, oval in shape, with the entrance at one side. All the material is welded together, skeleton leaves being largely employed. The interior is neatly finished off and lined with roots, grass and such like. The whole structure is about the size of a man's head and placed, as those were that I found, on a bare fork, they are not difficult to see. On the same day, my orderly found another nest, similarly situated, but some 30 feet up. This also contained 6 partially incubated eggs. On the 4th July, I found two more nests containing 3 and 4 eggs, respectively, which I left; while on the 11th July, I got 5 eggs from them, and found another containing young, and another, I think, being built. The hen sits close and only moves when the climber approaches. The nest really looks like a collection of old sticks, and does not give one the impression of being in use. I am recording this rather fully, as the record in "Nests and Eggs" is so different. Possibly the bird's habits differ in accordance with locality.

THE BROWN FLYCATCHER (*Alseonax latirostris*).—The breeding of this bird has been reported before from Mhow. I only write to confirm its occurrence. I found it very common on the ghats and discovered its nest by luck. I was watching a Southern Yellow Pit (*Machlolophus haplonotus*) building, when a little brown bird flew over me and settled on a bough, on noticing it, I found it was building. Once the bird's habits are known, the discovery of the nest is easy. It is usually situated some 20 or more feet from the ground, being compact and cup-shaped, a typical flycatcher's nest. Four eggs seem to be the complement. I took nests on the 20th and 27th June and 11th July.

THE BLACK BUNTING (*Melophus melanicterus.*)—Very common on the ghats, but I did not get many nests, as I looked in the wrong places. I seldom came on this bird building. It affects two sites, one well concealed under leaves and grass, the other unconcealed alongside roads in steep cuttings. When I discovered the latter fact, it was too late, for though I found many nests, the young were there or had flown.

THE CUCKOO (*Cuculus canorus*).—I have already reported that the Cuckoo is very common on the ghats here during the monsoon. I had the pleasure of getting an egg this year from the nest of the Black Bunting (*Melophus melanicterus*). On the 13th June, I found this bird building. The nest was well concealed among some dry leaves on the ground. I visited the nest again on the 20th, when I found it contained one Bunting's egg and one of the Cuckoo.

THE PARADISE FLYCATCHER (*Terpsiphone paradisi*).—I found several nests of this beautiful flycatcher. I fancy if I had laid myself out I could

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have found many more. Most nests were within hand reach. I saw no birds in white plumage.

THE PAINTED SAND-GROUSE (*Pterocles fasciatus*).—I found a nest with 3 fresh eggs, which unfortunately got broken, on the 17th February 1909, in some forest land. No nest to speak of.

THE LARGE GREY-HEADED FISHING EAGLE (*Polioaetus ichthyaetus*).—On the 23rd October, I saw a pair of these birds on a very large jhil, some 30 miles from this. They were very noisy, which attracted my attention. I noticed they were building and saw them "in copula." The nest was placed on the very top of a fairly large tamarind tree, on a small island. I did not go up to it, but from below it appeared to be a huge massive platform of sticks. I sent my orderly out on the 7th November, when he obtained 3 beautifully fresh eggs. He told me the birds were very bold that he had to take up a man with a long stick to ward off their attacks. This is the only occasion I have noticed these birds round here.

R. M. BETHAM, LIEUT.-COL.,
The 101st Grenadiers.

MHOW, C.I., *9th November* 1909.

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## No. XVI.—BIRDS' NESTING IN GARHWAL.

The following notes of some nests obtained at the snows this year may be of interest to some of your readers.

THE SNOW PARTRIDGE (*Lerwa nivicola*).—I found four nests during June at between thirteen and fourteen thousand feet; five appear to be the full clutch, and eggs were hard-set by the end of June, newly hatched chicks being seen early in July. The nests were all placed under overhanging ledges and were pretty well lined with moss and leaves; they are well concealed and the bird sits very close, but the cock-bird rather gives away the nest by calling and strutting about in its vicinity, however they take a lot of finding even then. The eggs are decidedly large for the size of the bird, measuring 2·2 by 1·43 on an average. In the "Birds of India" the ground colour is given as white; but out of 18 eggs there is only one that can be described as white, the ground colour in all the others being a pale *cafe-au lait*, and they are rather sparingly speckled and spotted all over with reddish brown, much resembling (except in being narrower) some eggs of the Koklass pheasant.

THE WHITE-WINGED GROSBEAK (*Pycnoramphus carneipes*). Several pairs of these birds were first observed at about eleven thousand feet, and they gradually moved up to fourteen thousand and there we marked down two nests and got three fresh eggs from each on June 28. One nest was in a birch about fifteen feet up, and the other about six feet up in tall bushes of juniper. Both nests were precisely similar and very curiously made, there being a sort of outer fence of prickly twigs, then twisted grass and the inner lining being entirely composed of strips of juniper bark. They were very wary and took a long time building. I first saw the females carrying grass on June 11

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I believe these birds have been found breeding at Kohat by Mr. Whitehead, but I do not think they have been recorded from these parts before. The eggs measure 1 inch by ·7 and are greenish grey, spotted and scrawled with purplish black and with pale purplish markings.

WALL CREEPER (*Tichodroma muraria*).—I found a nest in a boulder cliff at twelve thousand feet, but they were feeding young on June 12, and the young birds left the nest on June 27, when I secured one of them. The nest was nearly two feet inside wedged between two boulders and was a pad of wool and hair and grass.

THE RED-HEADED BULLFINCH (*Pyrrhula erythrocephala*).—One nest was taken at about twelve thousand feet, it was placed ten feet up in a small tree and was made of thin twigs and beard moss (*Usnea barbata*) and lined with rather coarse roots. There were four fresh eggs on August 28, they measure ·81 by ·56 and are a very pale greenish white, marked chiefly at the larger end with pale purple and dark reddish brown. These eggs differ from those of the European bullfinch in being very much paler in ground colour, and eggs of *Pyrrhula aurantiaca*, taken by Col. Ward in Kashmir, are pure white in ground colour and are very sparingly marked with reddish brown.

THE ORANGE-BARRED WILLOW WARBLER (*Phylloscopus pulcher*).—This bird was fairly common at thirteen thousand feet, but many nests were destroyed by some bird or animal and only two clutches were secured. In one of these clutches three eggs were unspotted white and the fourth had one single blotch of pale brown only, so it would seem that *pulcher* occasionally lays white eggs: all I have seen before were spotted with red. I have recorded this bird as nesting before, up the Bhagirathi Valley.

PINK-BROWED ROSE-FINCH. (*Propasser rhodochrous*).—Several nests were taken at twelve thousand feet in the latter half of August; they were placed low down in bushes and made of moss and dry grass and lined with hair. The eggs are rather a dark blue with a few black spots and occasional hair lines. I found the Himalayan Ruby-throat (*Calliope pectoralis*) and the Blue-fronted Redstart (*Ruticilla frontalis*) breeding freely at twelve thousand feet and upwards in the Niti Valley, and saw numbers of their nests. In "Nests and Eggs of Indian Birds" the eggs of these birds, both of which breed in precisely similar localities, appear to have got transposed; it is *Calliope* that lays the greenish blue eggs and *Ruticilla frontalis* the salmon-buff egg. *Calliope* lays sometimes unspotted eggs and sometimes faintly spotted with pale red, its nest is usually domed and is made entirely of dry grass. I only once saw a few barbel hairs used. *Ruticilla* builds with moss and grass and lines thickly with hair and wool. I was unable to secure the eggs of *Grandala cœlicolor*, though I am inclined to think they were commencing to pair towards the end of June. They moved up to over sixteen thousand feet, and there we twice saw a female apparently prospecting under rocks, but I had to leave those parts.

JEOLIKOTE, 20*th October* 1909. S. L. WHYMPER.



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## No. XVII.—BREEDING OF THE MASKED WAGTAIL (*MOTACILLA PERSONATA*) IN KASHMIR.

In his list of birds of the Province of Kashmir, Col. Ward remarks on page 723, vol. xvii, No. 3, of the Society's Journal, that this bird breeds at elevations of about 6,000 ft. to 8,000 ft. in Kashmir, and probably in Baltistan. In the 2nd edition of "Hume's Nests and Eggs of Indian Birds," it is recorded that Major Wardlaw Ramsay found the bird breeding in Afghanistan throughout May and June, and mention is made of one of the nests he found being placed *in a recess under a large stone* near the edge of the water, and again in Oates' "Fauna of British India"; it is stated that the eggs have not been described. It seems, therefore, worth my recording that last year (1908), towards the end of June, I found a pair of these birds building close to my tents at Arco, in the Siddar Valley, Kashmir, elevation 9,000 feet. After watching the birds carrying away bits of grass, etc. I discovered the newly commenced nest in a 'kulmanch' (*Viburnum fatans*) bush about two feet above the ground, and 100 yards or so away from water. The bush was isolated with open ground all round and over and over again I saw the birds fly into it, while the building was in progress. Before I left the camp, only one egg had been laid, so leaving it I later on sent for the nest which then contained 5 eggs. The nest was a fairly deep cup built of grass roots for a foundation and thoroughly well padded inside with hair wool and bits of cotton, etc., picked up round the camp. The eggs are very freely speckled with small dusky spots; especially so at the larger end.

20*th September* 1909. L. L. FENTON, Col.

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## No. XVIII.—A NOTE ON THE NESTING OF THE BESRA SPARROW HAWK (*ACCIPITER VIRGATUS*) AND THE ANDAMAN NIGHTJAR (*CAPRIMULGUS ANDAMANICUS*) IN THE ANDAMANS.

House crows not having yet been sentenced to transportation, an untidy collection of sticks in the fork of a rain tree, although overhanging a road to a small village, attracted my attention early in March this year, it contained nothing, but was noted for future inspection. On the 21st March I visited the spot again and found it contained two fresh eggs of the Besra Sparrow Hawk, thinking this was probably the full complement for the Andamans, as birds who should know better often play this trick on collectors here, I took them, but secured another egg in the nest on the 25th, my first piece of good fortune.

The jungle round here was a favourite hunting ground of mine, and I had placed nesting boxes for the Andaman Shama in it. I had also noted another stick nest in a rain tree not 100 yards away from the nest I had taken the Sparrow Hawk's eggs from, and it was during one of my subsequent visits that I found my little pair of Hawks were repairing this old home of theirs from which I subsequently (28th April) took four eggs slightly incubated.

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A

B

The Ibis-bill (*Ibidorhynchus struthersi*).
A. Nest and Eggs.
B. Bird sitting on Nest.

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The pluck of these little hawks in defence of their nest is wonderful, as, they swoop down on the marauder and once one struck my "topee", as I was watching the man at the nest, both male and female taking part in the attack; but they also have patience, as this pair returned to their first nest and hatched out their brood on the 14th June.

Three weeks to a month may therefore be taken as the length of time wild birds take to produce another sitting of eggs if the first sitting is taken and the following notes on the nesting of the Nightjar (*Caprimulgus andamanicus*) appear to substantiate this. Two fresh eggs laid on the ground as usual, taken on the 4th February 1907, and from a spot not a yard away, two more fresh eggs taken on the 25th February 1907.

Eggs from another pair were taken on the 6th March 1907, and again from a spot about two yards away, two more eggs slightly incubated on the 30th March 1907.

In 1908 I obtained two more clutches from the above first pair of birds on practically the same spot at an interval of about three weeks, but neither of these pair ever made an attempt at a third brood. I never visited the place this year, and I hope both pairs have raised their young in peace.

P. F. WICKHAM.

PORT BLAIR, ANDAMAN IS.
*August* 1909.

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## No. XIX.—NOTE ON INGLIS'S BUSH QUAIL (*MICROPERDIX INGLISI* GRANT).

To prevent any misunderstanding and to give honour where honour is due, I must state that the above bird was first obtained by my friend Mr. A. M. Primrose, unless the old skin in the British Museum is the same species. He sent me a pair of skins and then he and I together collected a series during a visit I paid him; an account of the shooting of the same was published in the Journal, at page 3 of this Volume.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY, LAHERIA SERAI P.O.,
23*rd August* 1909.

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## No. XX.—NESTING OF THE IBIS BILL (*IBIDORHYNCHUS STRUTHERSI*).

(*With a Plate.*)

In 1906 I obtained one nest of this bird at Gyantse and a note regarding it appeared in the Journal. This year I found several nests but with one exception they were just hatching and I was unable to take the eggs. The accompanying photographs show the bird sitting on the nest and the nest with the



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four eggs. The nest is made of small smooth flat stones and is situated on the stony track at the side of the river. These photographs were taken at Gyantse (13,100 ft.) on the 21st May this year. I also obtained a nest in the Chumbi valley on the 13th May at an altitude of about 11,000 ft.

GYANTSE, TIBET, *June 1909.* F. M. BAILEY.

[The printers in reproducing the above photographs have lightened the background behind the bird sitting on the nest, thus making the bird more conspicuous. In the original negative it was only with the greatest difficulty that the bird could be discovered, so wonderfully did it and its nest amalgamate with its surroundings.—EDS.]

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## No. XXI.—THE SNIPE-BILLED GODWIT.

In "The Ibis" for July 1909 Mr. H. E. Dresser records the occurrence of the *Pseudoscolopax taczanowskii* (*Macrorhamphus semipalmatus*, The Snipe-billed Godwit of the "Fauna of British India") in Western Siberia. Two birds, a male and female, were shot on 25th May 1908 "not far from Sara in the valley of the Irtysh, Tobolsk Government." The birds came into the hands of a correspondent of Mr. S A. Buturlin, who skinned them and in the oviduct of the female found a fully coloured egg ready for laying. The bird was first described by Blyth in 1848 from a specimen obtained in the Calcutta Market.

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## No. XXII.—SECOND OCCURRENCE OF THE SNIPE-BILLED GODWIT IN ASSAM.

It is a good many years since I first recorded the occurrence of *Macrorhamphus semipalmatus* in Assam but, until a few days ago when a small flock of four were seen in Shillong, there has been no further record. This flock appears to have been seen by two or three sportsmen in Shillong and finally Major Wilson of the 8th Goorkhas, hearing about them, went in pursuit and coming across a pair shot one, fragments of which he was good enough to send on to me. These and Major Wilson's description sufficed to enable me to identify the bird as *Macrorhamphus semipalmatus*, the Snipe-billed Godwit. Within Indian limits this Godwit appears only as a rare straggler, as a rule in pairs or very small flocks but often singly. It may however be more or less frequently overlooked though its conspicuously long bill combined with its otherwise godwit like appearance would attract the attention of most sportsmen interested in Field Ornithology.

Very little is known about the habits of this rare wader and its nidification is also practically unknown though I possess a *reputed* pair of eggs taken by a Japanese collector in Manchuria. Major Wilson describes its note as very similar to that of the common Godwits.

E. C. STUART BAKER.

SHILLONG, 24*th October* 1909.

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## No. XXIII.—OCCURRENCE OF THE LESSER FLORICAN OR LIKH (*SYPHEOTIS AURITA*) OUT OF SEASON.

On reading Miscellaneous Note (XII) in Volume XIX, No. 1, of the Society's Journal, I have been led to record this note about the occurrence of florican, which, I did not at first think worth mentioning, as there is nothing very unusual in finding florican—stragglers of course—at other times than in the rains.

Last year I stopped at Wadhwan in Kathiavad on my way to Mahableshvar and on the 1st November Mr. Strip, the Principal of the Girasia School, Wadhwan, very kindly took me out black-buck shooting. I was stalking a Chinkara* which had sat down in a cotton field and could not be seen and was walking alongside a bullock-cart going in the usual narrowing circle, while my son Vijayarajji was walking through the next cotton field. Just as he got to the end of the field, to a patch of long green grass growing in a little depression in the ground, he put up three florican, a female and two young birds. We marked them down where they settled and then, with some beaters, walked very carefully several times over this ground, but the florican would not get up again. On returning to the spot where the birds had been flushed originally, I put up the female again and shot it but could not find the two smaller birds anywhere. We therefore gave up the search for them and went on after black-buck. After going about three miles we came across another florican, also a young bird, which I got, so that we saw on that day four florican and bagged two.

I shot also a female florican at Kas in the Satara district on the 21st November 1908 quite close to the Kas Bungalow overlooking the Lake.

When florican are met with out of season, they are generally taken to be females. This, I think, is due to the change in the plumage of the cock birds, which exactly resembles that of the hens, when the cocks have cast off their wedding costume, which they only put on in the breeding season.

BHUJ, 25*th September* 1909. R. K.

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## No. XXIV.—LATE BREEDING OF THE INDIAN LITTLE GREBE (*PODICIPES ALBIPENNIS*).

To-day I took a nest of the Indian Little Grebe which contained four perfectly fresh eggs. The female which was on the nest was in breeding plumage but other birds in the same piece of water had assumed the cold weather garb.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY, LAHERIA SERAI P.O.,
23*rd October* 1909.

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* "Chinkára" (चिन्कारा) is I believe a misnomer for "Chhinkára" (छिन्कारा) as the little Gazelle is called in these parts, the latter name being derived from the sneeze like sound which it utters when alarmed; "chhink" (छिन्क) meaning a sneeze. It is also called "Kal punchhá Haran" or black-tailed deer and "Ratadiá Haran" or red deer on account of its fawn colour.

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## No. XXV.—INTELLIGENCE IN BIRDS.

In recording instances of "maternal solicitude" and the 'injury feigning habit in birds" of various kinds I, for one, must confess that I never thought of ascribing the action of the birds, to anything but instinct and it never struck me, to watch more closely, to see if reason played any part, as Mr. Dewar appears to have done.

However, whether the injury feigning habit, is due to instinct or intelligence, I leave to men more capable of passing opinions on the subject than myself to solve the problem, but that in other matters, birds show a tolerable amount of intelligence, I do not think there can be much doubt, and a couple of instances, which have come under my personal notice, may be of interest.

The first case is that of a King Crow. I was waiting near the Wazirabad Railway Station, in the Punjab, for a very dark and large Peregrine Falcon, that I had noticed pass that way on three successive days, with my nets and nooses and hoping it would pass again that day, and while sitting on a stone, I watched a flock of mynahs, turning up leaves for worms, while on the telegraph wires above, sat a couple of King-Crows, a Roller and a Hoopoe. One of the mynahs finally got a huge earth worm out, and the one next to it, promptly made for it to take away the tit-bit. Suddenly there was heard, close overhead the double note "titu" twice repeated of a "shikra" (*A. badius*). The mynahs and hoopoe, were off like a shot for the nearest tree, leaving the worm behind, when down came the King-Crow and secured the prize. I have frequently heard the King-Crow give this call and the imitation is simply perfect, but never before nor since, have I known one to make such use of his powers of mimicry.

The second instance is that of a Peregrine Falcon. I was after duck, in a narrow water channel with a caste of peregrines and we had been vainly trying to put up a gadwall. It had originally been flushed from a pond some distance away and taken refuge from the two peregrines, which were in hot pursuit, in this water cut, about 8 ft. wide, with sloping grassy banks. In vain we threw bricks and mud at it, but it would not leave the water, and if it did, it was only to fly ten yards or so, and drop in again the moment the falcons got near. Up and down that cut we went for about ten minutes, or more, till the duck took to diving, and as the little head appeared close to the edge, one of the falcons would make a dart for it, but only to find it gone, when she got there. Both falcons had given up "waiting on," and were now seated on the bank, close to the water's edge, but flew the moment the head appeared and made for it. The water was fairly clear and the duck quite visible when near the surface, and as it passed under one of the falcons, she ran along the edge beside it, not attempting to fly, and as the beak came up, in among a lot of grass, out shot a claw and grabbed it. I expected the duck to pull the falcon into the water, but she seemed to have provided for this contingency, and had a firm hold of the grass with her other foot. This feat struck me as having

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been well worked out, and she must have said to herself, after 10 minutes of vainly darting too and fro. "This is a poor sort of game, and each time I get near enough to make a grab, the beastly thing disappears under water and where I dare not go, and now here it comes, making straight for this grassy bit, where I have already had half a dozen shots at it, but it seems to see me in time to get out of the way, so let me see if I can do better by keeping to the ground and grabbing the head the moment it shows above the water, if near enough to the bank, as it generally is."

What appears to me to be a case of very deep reasoning on the part of a Golden Eagle (*A. chrysaëtus*) was brought to my notice only a short time ago.

I took a half fledged eyass from the nest in the middle of June last. On the 16th of July she had her first fly or rather a very poor attempt at one, but once having half flown, half tumbled out of the nest, I made for her, on a tree, she was always experimenting, and with the help of a strong breeze, got in some quite long flights, before the end of the month, till one day I lost all trace of her. Seeing no signs of her the next day, I went up the hill to some cliffs, some 2 to 3,000 feet above my bungalow, and was soon attracted by her call, and when I got round the spur, to my horror, I found her with two wild ones and presumably her parents, which flew off as I approached. Off she went with them and after vainly chasing them from ridge to ridge, I was on the point of giving up the job of getting her back as hopeless, but I had fortunately taken my gun with me to shoot her, a crow to call her with, *en route*, and as a last resort, thought I'd try peppering them, to get them away from her, for they always circled round where she sat. I got to within 50 yards or so of her and waited behind a rock, and as they passed overhead I gave them a charge each, and both went off very much faster than mine could follow, and as soon as they were gone, mine came down to me, without any trouble. Since then, my bird was once away for 6 days and came back of her own accord, closely pursued by the wild ones giving her a very poor time of it.

I keep her always loose, but now she hardly dares to leave the bungalow, and if she soars up to any height, she will suddenly be seen to drop, with closed wings and make straight for the bungalow, and two specks dropping from the heavens after her. On one occasion, one of them caught her up and gave her a very nasty whack and sent feathers flying in all directions

Only a fortnight ago, these very birds did their best to entice mine away, so why this sudden change in behaviour towards her now? Could they possibly connect the charge of shot, they each got into them, with her? This is the only explanation I can give, strange as it seems, and if this is the case, their reasoning is certainly very sound. The jesses and bells could not be the reason, as she had them on when she first went off with them.

Then again her returning to the bungalow, after being away for 6 days and when in trouble with her parents, to my mind shows a certain amount of

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reasoning power. Her natural impulse was to go off either with her parents or on her own and enjoy to the full her newly acquired powers of flight, and hunt for herself, but when she found she could not catch anything, and moreover got badly knocked about by her parents and was not so strong on the wing as she thought herself, she decided to return to the place where she had never gone to bed hungry, nor been ill-treated. Surely this shows a certain amount of intelligence. She knows my dogs and says nothing to them, but let a stranger dog appear and I have some difficulty in keeping her from going for it, and so long as the dog is in view, she does nothing but bait.

When first I taught her to come to the lure and gave her food on the ground, I had to be very cautious in all my dealings with her, and once she got her talons into her prey, I had to be very careful how I approached, for one foot invariably shot out and grabbed my gauntlet, while the other held on to the crow. She seemingly feared my taking it away from her and resented my even coming near. Now she permits me to handle her freely, even when feeding, and in the case of a bird, allows me to help her pluck the feathers and twist it and turn it about for her. It was instinct that first taught her to protect her property, and I took a photograph to show the way she covered up her food with her wings, and I hope to get another one taken as soon as possible to show the difference in her demeanour now when feeding. She must have reasoned it out and said to herself "There is no point about my hiding my food from this man, he does not try to take it from me, and moreover helps me to pluck the feathers, so I will let him handle my prey." Crows mobbing an eagle, generally take good care to keep well above him, but the moment the eagle happens to get above them, they very soon make tracks for the nearest scrub. Of course I allude to the hunting eagles, such as the Golden, the Bonellis or the various species of *Spizaeti* and not to the Imperial and Tawny and other carrion feeders which could not catch a crow under any circumstances. The crows know they are perfectly safe while above the eagle and moreover can rise as quick, if not quicker than he can. They would not dare to mob a peregrine falcon out in the open.

If any body wishes to try the experiment, go to a place near any river where crows are in the habit of roosting, and watch the place 3 or 4 days in succession. The moment an eagle comes along and Bonellis eagles, frequently pay late visits to these corvine colonies, up will rise hundreds of them and mob him. A Peregrine comes along later and every crow will go helter skelter for all he is worth. Yet why? Both are enemies and both have come there for the same purpose, *viz.*, to catch a crow for his dinner, so why not run from both, or attack both? Is it instinct that has taught them, that one is much heavier and slower in rising than the other, and they can afford to play tricks with the one, which they would not dare with the other?

An eagle that has come down to a bait without the slightest hesitation the first time, and been caught in a net and escaped, will never be so caught again

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in a hurry. This was the case with a Hodgson's Hawk Eagle (*S. nepalensis*) I caught in Kashmir. I knew him well by his wanting a crest and one wing feather The former was noticed while sitting and the latter when flying and he was always to be found in a deodar forest near my camp. The very first day I saw him, I caught him within 2 minutes of putting up my net and a pigeon behind it, but he escaped out of my hand shortly after. From that time on I tried him with nets and nooses, with fowls, doves, chikor and even an irresistible rat, but all to no purpose, and nothing would induce him to come again. One evening, however, I watched where he roosted for the night, and before it was light next morning I had gone and set my nooses, with a rat as the bait, and hid in a cave close at hand. As soon as it was sufficiently light to see, he came down without hesitation and was caught.

It was instinct that led to his capture in the first instance and in the last—a natural impulse, when hungry, to pounce on anything, more especially so, when that thing appeared in difficulties and unable to fly or get away ; but it looks very like reason that kept him from coming, the dozen or so other times, I tried for him. Sometimes he flew away as soon as I began putting up my nooses or net, even a couple of hundred yards away, and at other times, he simply sat on, but would not come down. When he saw me put up the net, he said to himself:— " Oh, there he is again at his old game, but I have been there once, and never again".

On the last occasion, he had not seen me and came down at once. Some birds show much more intelligence than others. I have known falcons to come down full speed and pull up dead at the net and go to one side, or over it, but would not go into it, whereas a pair of red-headed merlins (*Ae. chiquera*) on one occasion, actually seemed bent on being caught. The net had been put up a little too taut and would not give or fall, and first the tiercel came down, hit up against the net and fell back on to the ground ; then he made another attempt with the same result. In the meantime, the female came down and fared no better, but the net gave a little this time, and the sticks supporting it bent slightly. Then they both ran at it, to get to the quail on the other side, got their heads through the meshes and strained and pulled and fluttered, but would not give up, till finally the sticks fell and both were caught. A sparrow hawk (*Accipiter nisus*) I once caught in a net over a quail, got out of a hole in the net, just as I got up to him, but came down again 20 minutes later, for a sparrow, within 30 yards of where he had been caught before, into the same net, but did not get off that time.

The irresistible impulse of going for anything in difficulties, I should say was instinctive, but *not* to go for it, or pull up the moment the net is spotted as something suspicious and to be avoided, I can only put down to reason.

I do not wish to appear dogmatic, and only give these instances and my theories, for what they are worth



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If I am wrong, I shall be only too glad to be put right, and am quite open to conviction, but so far I must admit that I still stick to my own opinion that birds and beasts show much more intelligence and reasoning power than we give them credit for.

C. H. DONALD, F.Z.S.

BUSHAHIR STATE, SIMLA DIST., 20*th September* 1909.

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## No. XXVI.—EXTENSION OF THE HABITAT OF THE SAND SNAKE (*ERYX JACULUS*).

Major O. A. Smith, among other snakes collected in Jhelum, has sent me a single small specimen of the Sand Snake (*Eryx jaculus*). This widely distributed species is reported by Boulenger (Cat. Vol. 1, p. 126) from the Ionian Islands and Greece in the West, Northern Africa, South West and Central Asia as far North as Turkestan, to the Western Afghan Boundary. Dr. Annandale has also recorded it from Seistan (Mem. As. Soc. Bengal, Vol. 1, No. 10, p. 200). As far as I am aware, it has never been reported farther east, so that its occurrence in the Indus Basin is a considerable extension of its previously known zone of distribution. It appears to me extremely likely that it has been encountered in the Indus Basin before, but taken for its common Indian relative *E. conicus*, but the sharp rostral transverse ridge, which is not seen in *conicus* is very distinct in this specimen. There are 9 quite smooth scales between the eyes, and the costals number at a point two heads-lengths behind the head 46, at midbody 52, and two heads-lengths before the vent 36. The ventrals are 189, and the subcaudals 30 of which the anterior 24 are entire. The anal shield is entire and narrower than the ventrals (about two-thirds).

F. WALL, C.M.Z.S., MAJOR, I.M.S.

CHITRAL, 15*th October* 1909.

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## No. XXVII.—A SECOND SPECIMEN OF THE SNAKE *OLIGODON ERYTHROGASTER* FROM THE EASTERN HIMALAYAS.

In 1907* Mr. Boulenger described this species from a single specimen obtained at Nagarkote, Nepal (6,000 feet) which is now preserved in the Indian Museum, Calcutta. I have just received another specimen from Tindharia which must have been collected at an altitude below 2,800 feet, and as no figure appeared with the original description, I herewith attach outline drawings to show the cephalic lepidosis.

I think there can be no doubt that this is the snake to which Dr. Günther† refers which Hodgson obtained in Nepal and made coloured drawings of, which he presented to the British Museum. Dr. Günther at first referred these to *S. octolineatus*, but subsequently expressed the opinion that they represented a species up to that time unknown.

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* Rec. Ind. Mus. Vol 1. pt. iii.

† Rept. Brit. Ind. 1864, p. 206.

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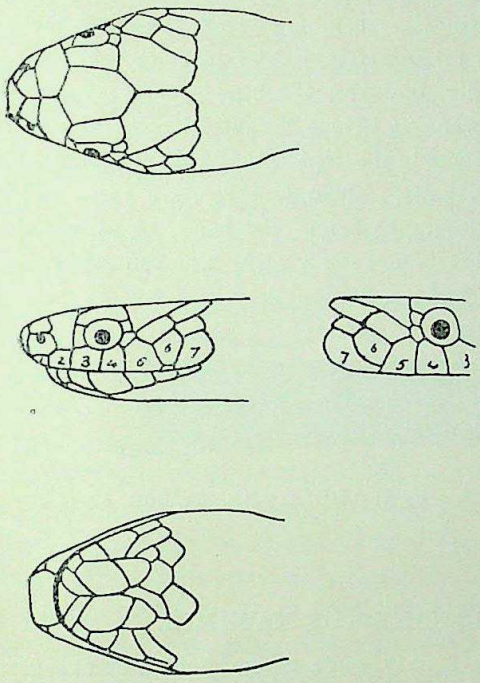

*Oligodon erythrogaster* (× 2).

My specimen agrees well with the type which I have examined. The following features deserve special mention. The costals are 17 in the anterior and middle parts of the body, and decrease to 13 posteriorly. The absorption is effected thus—from 17 to 15 the 3rd and 4th rows above the ventrals on the right side, and the 4th and 5th on the left blend, and from 15 to 13 the 4th and 5th coalesce. (In this respect this specimen differs from the type, in which the rows reduce to 15.) The ventrals are 165, anal divided, and subcaudals in 57 pairs. There are 7 supralabials on both sides, and I think Mr. Boulenger would have been more correct if he had counted those shields as 7 in the type (not 6), for he records the temporals in the type as two, evidently taking the 6th supralabial for an inferior temporal. In my specimen the 6th supralabial fails to border the lip on the right side (as one sees sometimes in other species of *Oligodon* and *Simotes*), and has a small portion detached on the right side. The temporal, too, I consider single as I do in the type specimen.

The dentition is peculiar. The *maxilla* supports 7 teeth on the left side, and 8 on the right of the usual syncranterian type seen in *Simotes* and *Oligodon*. There is a short edentulous space anteriorly. The palatine has 3 teeth on the left side and 2 on the right situated in the middle. The pterygoid has a single very small tooth near the middle. The mandible has a short edentulous space anteriorly, then 6 subequal teeth on the right side (5 on the left), then an edentulous interval followed by a single tooth.

F. WALL, C.M.Z.S., MAJOR, I.M.S.

CHITRAL, 19*th November* 1909.

## No. XXVIII.—A VARIETY OF THE COMMON COBRA (*NAIA TRIPUDIANS*) FROM CHITRAL.

On the 13th October a young cobra was brought in to me presenting characters of so distinctive a nature that I at first thought it claimed recognition as a variety distinct from any previously recorded. The first thing to attract attention is its colouration. Thus it is olive-brown completely

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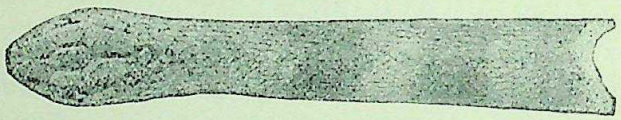
banded with darker rings which are broader than the interspaces. The first band is below the neck, and this and the second are black, the third blackish brown, and the succeeding ones progressively lighter in colour, but remain apparent to the vent. On the belly, however, the hinder ones become less apparent, and are lost before the vent. There is no suspicion of any marks on the hood. I can find no differences in the lepidosis of this compared with variety *typica*, except in the scale rows. These, however, are very singular, numbering 19 at a point two heads-lengths behind the head, 19 at midbody, and 15 at a point two heads-lengths before the vent.* The ventrals number 195, and the subcaudals 69. I append a figure.



F. WALL, C.M.Z.S., MAJOR, I.M.S.

CHITRAL, 15*th October* 1909.

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## No. XXIX.—THE SNAKES OF KASHMIR.

During several visits to Kashmir I only came across four different kinds of snakes; two poisonous and two harmless. Of the latter, one was the ordinary *Dhâman* or Rat Snake (*Ptyas mucosus*). The natives I questioned in the matter, called it simply *sâmp*, *i.e.*, "snake": it seemed to have no other local name. I saw no very large ones, and they struck me as being of a somewhat darker colour than those I had seen in India. They were fairly common in the main Valley. The other non poisonous snake I have not as yet been able to identify, but as I have a bottled specimen I hope to do so in a short time. I may merely state here that the snake is of slender make, about 18 inches in length and of a general ashy brown colour. I only found it in the Siddar Valley, above Páhlgám at an elevation of about 8,000' to 9,000'. My natives could give it no local name.

The two venomous snakes were locally known as the *Pohur* and the *Gûnas* respectively.

The *Pohur* is the common Himalayan viper, *Ancistrodon himalayanus* described by Major Wall, I.M.S., on pages 34 and 35 of his book on the Poisonous Terrestrial Snakes of India, and mentioned by Lawrence on page 55 of his

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* This specimen proves to be an exceptional one, for since writing the above I have acquired 9 more, in all of which the scale rows are 21. Further in adult specimens all the bands are brown, and seem to grow less distinct with age. I have also examined two specimens of this variety in our Society's Collection, one from Aden, the other from Paraclinar (N. W. Frontier). They constitute a variety of Boulenger's *Coca*, and the young agree with a specimen figured by Eichwald (Faun Casp-Cauc. Plate XX) under the name *Tomyris axiana*.—F. W.

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book "The Valley of Kashmir." Lawrence remarks that the bite of the *Pohur* like that of the *Gûnas* is said to be usually fatal. Colonel Unwin, whom Lawrence also quotes, believes the *Pohur* to be deadly but is doubtful about the *Gûnas*. Lawrence, on the other hand, states, that he lost one of his surveyors, who was bitten by a *Gûnas* at Sonâmarg. The descriptions given by both these writers, are somewhat vague and meagre and Colonel Unwin has, I think, got rather mixed up in applying the local names to his snakes. What he refers to as the *Pohur* is, I am confident, the larger of the two poisonous snakes which is locally called the *Gûnas*. Lawrence does not make the same mistake, but passes over Colonel Unwin's without comment. Major Wall remarks in his book with regard to *Pohur*, that he knows of only one authentic record of a bite inflicted by this species. My own experience of it is as follows:—I found it at higher altitude than the *Gûnas* and far commoner. It simply swarmed in some localities; for instance at Bukhtaor beyond Kauzilwán on the Gilgit road; an open and rather swampy plain just above the village was an especially favourite locality for them; also at Thaoba, the next village on the Kishengunga river; again at Buj Marg in the Siddar Valley above Páhlgám, hardly a day passed without one or more being killed near my camp. I found them also in the Erin nala: in fact, I imagine they are to be found on the slopes in almost every part of the valley, only some localities are favoured by them more than others. The first case I came across of a man being bitten by a *Pohur* was in the Erin nala. It was late in the evening when a man arrived at my camp for medicine. The man who was bitten, he stated, was unable to walk. Having no permanganate of potash with me, I sent him some concentrated vinegar to rub into the wound. When I saw him the next morning I found he had been bitten in the foot; his leg was much swollen with a ligature tied tight round it below the knees. The man was evidently in great pain, but said he was feeling better than he did when he sent to me on the previous night. He had not made use of the vinegar, but on the advice of a Goojar, he had applied a number of leeches all round the seat of the wound which had considerably relieved him. In a few days he had quite recovered. My next case was that of a Goojar, who managed to limp up to my camp, in the Siddar Valley. There were the usual symptoms, but there was less swelling than in the first case. The wound was in the foot, the man having been bitten in the foot while cutting grass. I treated him with permanganate of potash and he was all right again in a day or two. My worse case was that of a young fellow, who resided at Mundlan in the Siddar Valley. He was bitten in the ankle, and sent for me as soon as he reached home. I was with him in half an hour. His leg was much swollen, he had tied a ligature above the wound, and his mother was bathing his foot, with a native concoction of mud and some kind of herb. After washing the wound, I lanced it until the blood flowed freely and then applied the permanganate of potash. On the following morning, he was better and the next day about again. A few days after this, while out shikaring a Goojar was brought to me. He had been bitten some days before, on the point of the thumb·

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The usual swelling had disappeared but his thumb was quite black, the ball being filled to bursting, with decomposed blood. He had never thought of lancing it. I did this and the permanganate of potash did the rest. His thumb was saved, but it looked very like mortification when I first saw it.

I made many inquiries, but never heard of a fatal result from a bite. The permanganate of potash treatment certainly had good results. The natives soon recognized this, even my shikari, who started by laughing at it, but all the same, was one of the many applicants for a supply of it, when I was leaving Kashmir.

The so-called *Gûnas* or *Ghanus* of Kashmir is found at lower elevations as a rule than the *Pohur*. It is a larger snake than the latter, of an ashy grey colour, with 25 to 26 scales in the middle of the body. There is, in a specimen I shot, some indistinct light brown markings at the back of the head. The 13 or 14 central scales on the back are unmarked ; then comes a line of the same light brown colour, on either side, all down the back and the scales extending from these coloured lines to the ventral scales, some six in number on either side, are all more or less marked with the same colour. All my specimens were too much damaged for me to fix the identity of the snake with any degree of certainty. A damaged skin, I possess, measures 27 inches in length. The head is covered with small scales. As well as I can judge from Major Wall's description I think the snake must be *Vipera lebetina*. The natives declared that an old *Gunas* not *Pohur* as stated by Colonel Unwin, grew hairs on its head. I offered a large reward for a hairy specimen, but with no result ! The natives state that the bite of a *Gûnas* is generally fatal. I never came across a case, but have no reason for doubting their word.

L. L. FENTON, Lt.-Col.

N. Devon, 30*th September* 1909.

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## No. XXX.—DO WILD ANIMALS DIE A NATURAL DEATH.

I was much interested in finding that Col. Evans has, on page 273 of Vol. XIX of the Journal, taken up the question I started. But before writing any further I would like to point out that in my letter which he refers to I have not been dealt with quite fairly by the printer's devil. He has put in stops which I do not think were in my letter and in one place he has made me write "entirely Europeans, not the Natives of the jungles." What I wrote was "*not only Europeans, but the Natives of the jungles,*" which quite alters my letter as printed. My idea is that no wild animal ever gets the chance of dying from old age, but is always killed off and eaten by some other animal directly the powers that Nature has endowed him with become impaired. Possibly disease carries them off, but if so what becomes of them, for dead animals are seldom met with, and in the case of such as are found, death is ordinarily due to some violence that has been met with. I would have said in the absence of the instances given by Col. Evans, death

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is always traceable to violence of some sort or other; for I have never come across any dead wild animals beyond the one mentioned in my first letter (and even that one may have been killed by a snake) that has not been killed by a tiger or met with a violent death of some sort or other. One does read of animals retiring to some secluded spot to die in, but what secluded spots are there that antelope (the animals that swarm in such numbers on the hot plains of India) can retire to? My question "Has any one ever come across vultures feeding on a dead wild animal?" of course, alludes to animals that have died a natural death.

W. G. BETHAM, I.F.S.

FRAMPTON-ON-SEVERN, GLOUCESTERSHIRE,
*5th August*, 1909.

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## No. XXXI.—ENTOMOLOGICAL NOTES.

### (*a*)—THE INTERNATIONAL CONGRESS.

An International Congress of Entomology is to be held in 1910 at Brussels, a little time before the International Congress of Zoology to be held at Graz. This Congress will be the first for Entomology as a separate subject, and resolutions made by the Congress will then be put before the Zoological Congress.

An Indian Sub-committee has been formed of which the Honorary Secretary of this Society is a member; printed information will be sent out to all who are interested; the Sub-committee are especially anxious to find a delegate to represent India at the Congress, and hope to hear of some member of the Society who is keen on Entomology and who will be in Europe at that time and willing to attend the Congress, which meets from August 1st to 6th. The Sub-committee also wishes to obtain papers to be read at the Congress and will be very glad to hear from members who will submit papers on any branch of Entomology. The Congress is meant to discusss all aspects of entomology, the applied as well as the technical, and it is hoped that such important questions as insects and disease, insects in relation to man and agriculture will be a feature of the Congress. Papers may be sent to the Honorary Secretary, or to the Chairman of the Indian Sub-committee, the Imperial Entomologist at Pusa.

### (*b*)—THE INDIAN NEMOPTERID AND ITS FOOD.

In "Indian Insect Life" (p. 160) some notes were given upon the egg and larva of the common hemopterid (*Croce filipennis Westd*); since that time, these larvæ have continued to flourish in captivity, and it has been found that their food is the egg and immature stages of the common fish insect (*Acrotelsa collaris*, Fabr.) which is so abundant in houses; to feed the former, the fish insect is being bred also. The larva of *Croce* has not as yet developed the long neck, characteristic of the larva figured in text-books; its development is

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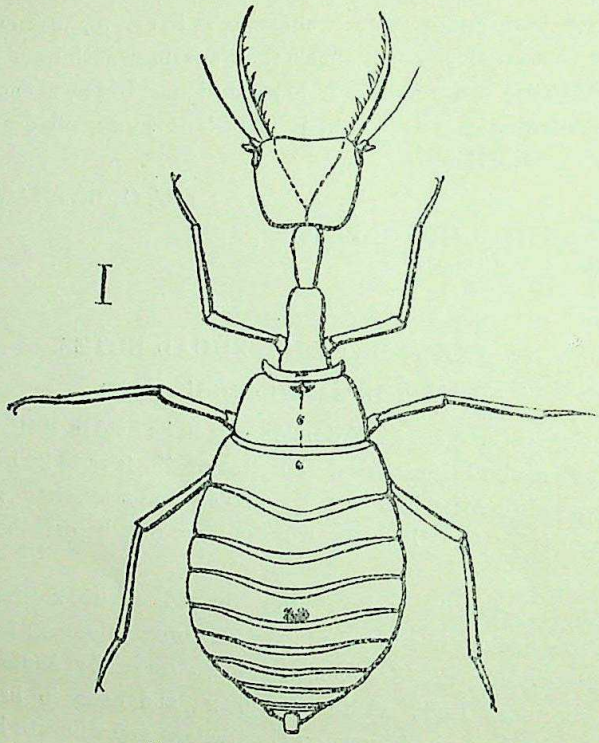
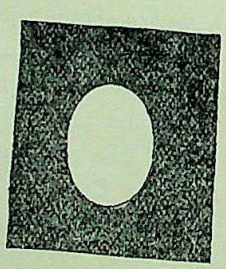
slow, and it is apparently one-brooded, a whole year being occupied by its metamorphosis. The larva is small soft and whitish in colour; it is probably extremely common in houses, but lives a retired life, being active at night.



*Croce filipennis* larva, first stage.



*Acrotaxa* egg ( × 15).

The fish insect is fed wholly upon paper, and thrives on that diet; its eggs are soft, oval white eggs, laid, in captivity, among the paper loosely and not adhering to each other on the paper. The nymphs are readily reared on paper, and the whole life history goes on in an ordinary bottle containing torn-up paper.

In the Pusa Laboratory, which has been occupied only one year, there has been a plague of fish insects which have multiplied enormously, feeding on all

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abels, papers, etc., which are not poisoned or shut up. This is likely to be due to the fact that, as yet, *Croce filipennis* has not found the building to be a suitable habitat, and the fish insect is breeding unchecked when, in an old building, its enemy would also be in occupation. This may apply also to other enemies of the fish insect if there are any ; the fish insect was brought into the Laboratory with records, etc., and is extremely abundant now.

(*c.*)—STORAGE OF INSECTS.

In a previous issue of this Journal, some information was given about storage of pinned insects. Another year's experience has shown that the paraffin-napthalin box described there has been almost entirely successful ; in three boxes, out of over 150, mould appeared on a few specimens ; no insects were found attacking the specimens at all.

A modification of the box, in which an enamelled cork sheet, set in paraffin, was put in the bottom of the box, and the paraffin-naphthalene mixture above, has proved a failure, and the box, as originally made, is apparently the best. No benzene or other chemical at all is applied to these boxes, and, in spite of a very wet season, the collections have been better preserved than in any previous year.

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(*d.*)—ALCIDES.

The genus *Alcides*, among the weevils, is known to contain several species injurious to crops, and a new one has recently been added ; *A collaris*, Pasc. has been reared from swellings found upon the stems of tur plants ( *Cajanus indicus* ) ; these swellings are like galls, found upon the stem at soil level on young plants at Dharwar farm. The grub is in the gall and pupates there, the weevil emerging by biting through the gall. The insect is in no way a serious pest, as it is not a common or abundant insect ; so little is known of weevil's life-histories that this record is of interest ; the other two common species of *Alcides* in India breed in cotton ( *Alcides leopardus Ol* ) ; and in species of Sesbania used as shade for the growth of *pan* (*Alcides bubo*, F.), both being destructive pests where they occur.

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(*e*).—THE DECCAN GRASSHOPPER.

Amongst the interesting occurrences of the year is the study of the curious wingless Grasshopper of the Deccan, which has been doing an increasing amount of damage, culminating in a fairly large outbreak this year. The insect is a species of *Orthacris* of the *Pyrgomorphine* division of the *Acridriidæ* ; five Indian species are described and the present species is probably a new one.

It is, when mature, wingless, and resembles an ordinary hopper ; it is likely to be one of the insects which, by coupling in a wingless and therefore *apparently* immature condition, has given rise to the statement that there are



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species in India which couple before completing the matamorphosis and passing through the last moult. The other species associated with this belief is the Rice Grasshopper (*Hieroglyphus banian*, Fabr.) which has short-winged mature forms, which look like nymphs but are really mature ; these of course couple and lay eggs while appearing to be nymphs.

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(*f*.)—New Rhynchota.

Large numbers of new *Rhynchota* are still being described by Mr. Distant, the last series being in the Annales de la Societe' de Belgique, where thirty species are added to the Indian fauna. The most interesting are the three species of *Salda* and two of *Aradus* ; these obscure families are little collected or known in India, and there are probably many species to be found in the moist hill tracts of India. *Salda pusana* Dist, described from specimens that were mutilated by the Post Office in transit to England, was found at Lebong on the boulders in the river over which the water pours producing a thick growth on the sheltered underside of green moss, in which lives a very peculiar fauna. The collector in the hills will find extremely interesting material in such localities. The appendix volume of the Rhynchota in which all the new species will be described, will be awaited with interest, and it is to be hoped that all who have collections of *Rhynchota* will have them examined, and the new species sent to Mr. Distant for inclusion in this volume.

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(*g*).—Where Cicindela Breeds.

Cicindelid beetles are common insects of the plains, occurring abundantly in crops, waste-lands, and especially on flooded lands at the close of the rains. While larvæ which corresponded with *Cicindela* larvæ, in Europe have been found in wet sand near rivers, they have been so rarely found that they could not represent the common species which occur in abundance. Recently such larvæ have been found in greater abundance and under circumstances that point to their being the common species so abundant in the plains. The larvæ were found in land which had been slightly waterlogged and so was well compacted and solid after the rains closed; each larva lives in a vertical tunnel, as is well-known, the tunnel ending at the surface in a round hole ; when one looks at the soil in which such larvæ are living, one sees a small hole ; watching it and then looking away at others, the original hole disappears and cannot be seen ; *Cicindela* larva has come up, and its flat dark head has filled up the top level with the soil ; if one moves, down goes the *Cicindela*, and the hole is at once obvious. Such holes are common in wet lands in October, and the tunnels extend down about five inches into the soil ; the *Cicindela* larva grips anything that runs over by its recurved mandibles, which project over the head ; it then goes down with the victim, feeds on it, and placing the empty skin on the flat head ascends to the surface and jerks the remains away clear of the opening of the tunnel.

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In September, the common species of *Cicindela* are extremely abundant as beetles on wet alluvial lands near rivers, on the wetter parts of cultivated lands where the soil is compact and are presumably laying the eggs from which come the larvæ to be found in late October, before which time the beetles are dead.

*Cicindela* has not, in this country, been reared as yet; all our previous attempts have been failures, but with a larger supply of material, we hope to be more successful.

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(*h*).—Attraction to Light.

In "Indian Insect Life" (p. 106) we have discussed this point, and those who have read the interlude there may be interested in the subject. Forel, the author of "The Senses of Insects," has there pointed out that the attraction of a bright light is probably due to the confusion produced in the brain of the insect by a concentrated point of light, an effect occurring in Nature only from the sun which is overheard, while our lights are at the insect's level. He also rightly points out that household insects are not attracted by light, being accustomed to our artificial lights and not attracted by them. On the other hand, moths especially are freely attracted by a large white sheet, that is, an area of diffused white light, in preference to a point of light.

A long series of experiments were made in India with coloured lights, but they yielded little result of interest.

Another point is that the bulk of the insects which come to light are crepuscular soil insects, accustomed to fly in the dark and entirely unaccustomed to a concentrated bright light.

We have found also that in bad weather, many insects come to light that do not ordinarily do so, and we believe this is not so much the light as shelter from the wind. Bees and dragon flies are quite common at lights in houses in rough weather, whereas they are never so found ordinarily; the bees have presumably been overtaken before they could reach the rest, and the dragon flies, ordinarily sleeping out in an exposed position, are the first to feel a high wind and be blown away.

Light traps are in fairly common use as against some pests, especially in the tropics, but the opinion is often expressed that a light trap catches more beneficial than injurious insects, and so does harm. We believe this to be an entirely mistaken idea; the 'parasites' that the light is supposed to attract are usually winged ants.

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(*i*).—The Eggs of Oligotoma.

*Embiidæ* are insects, of which not much is known, though they are to be found in most localities in India. In the plains all attempts to rear them have failed, but under more favourable circumstances at Lebong, at

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an elevation 5,000 feet, *Oligotoma saundersi* lived for weeks in captivity laying eggs freely. The eggs are oval, pearly-white, laid singly or a few together on the tree or the bark under which they live, in or near the silvery ramifying tubes prepared by the insects. The young are white and become pink as they grow older. We found colonies of these insects in all stages under the bark of a dead tree ; in captivity they lived quite well, feeding apparently upon the bark ; there was no other food and the colony throve and multiplied, laying eggs freely.

In the plains the colony died, despite all precautions, probably from the altered conditions of moisture.

H. MAXWELL LEFROY

AGRICULTURAL RESEARCH INSTITUTE,
PUSA, BENGAL, *December*, 1909.

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## No. XXXII.—SOME NOTES ON THE PALM *OREODOXA REGIA*.

(*With a Plate.*)

*Oreodoxa regia*, though a native of Cuba, is very commonly found cultivated in Indian gardens. As might well be expected, it is treated of by many botanists, but strange to say their descriptions sometimes widely differ from one another, as will be seen from the following short account :—

Bentham and Hooker[1] say that there are two complete spathes, the lower one semi-cylindrical as long as the spadix, the upper one ensiform, split on the ventral side. Kunth[2] mentions that there is only one spathe. Scheffer[3] is also of the same opinion. In a specimen which I examined there are clearly two spathes. The whole inflorescence, a compound spadix, is enclosed in a big complete spathe measuring 3′-1″ (fig I-*a*). A second incomplete spathe entirely surrounds the lower half of the complete spathe. The incomplete spathe is 1′-2″ long on the ventral side and 9″ on the dorsal (fig. I-*b*). The outer one is incomplete in a later stage, but may have been complete in the beginning and due to the faster growth of the inner spathe, left incomplete. In the beginning of January when I observed the spathes, the inner one was about 1′ long and the outer about 3″. At the end of June they attained their full development. The incomplete spathe detaches itself from the inflorescence, leaving a scar (fig I-*c*), sometime before the complete spathe opens. The complete spathe opens ventrally by a slit (fig. I-*d*).

Kunth says that the flower bearing branches of the spadix measure from 3″ to 4″. In my specimen they were from 2″ to 6″ long. The girth of the main peduncle is 6″. The primary as well as the secondary peduncles are scurvy. The length of the inflorescence is 2′-3″.

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[1] Genera plantarum, Vol. III. p. 898-900.

[2] Kunth in Humb. et Pompl. nova Gen. et. Spec. pl. Vol. I. p. 244.

[3] Scheffer in a manuscript note according to Beccari in "Illustrazione dialcune Palme Viventi nel Giardino Botanico di Buitenzorg in Annales du jardin Botanique de Buitenzorg, Vol. II, p. 148."

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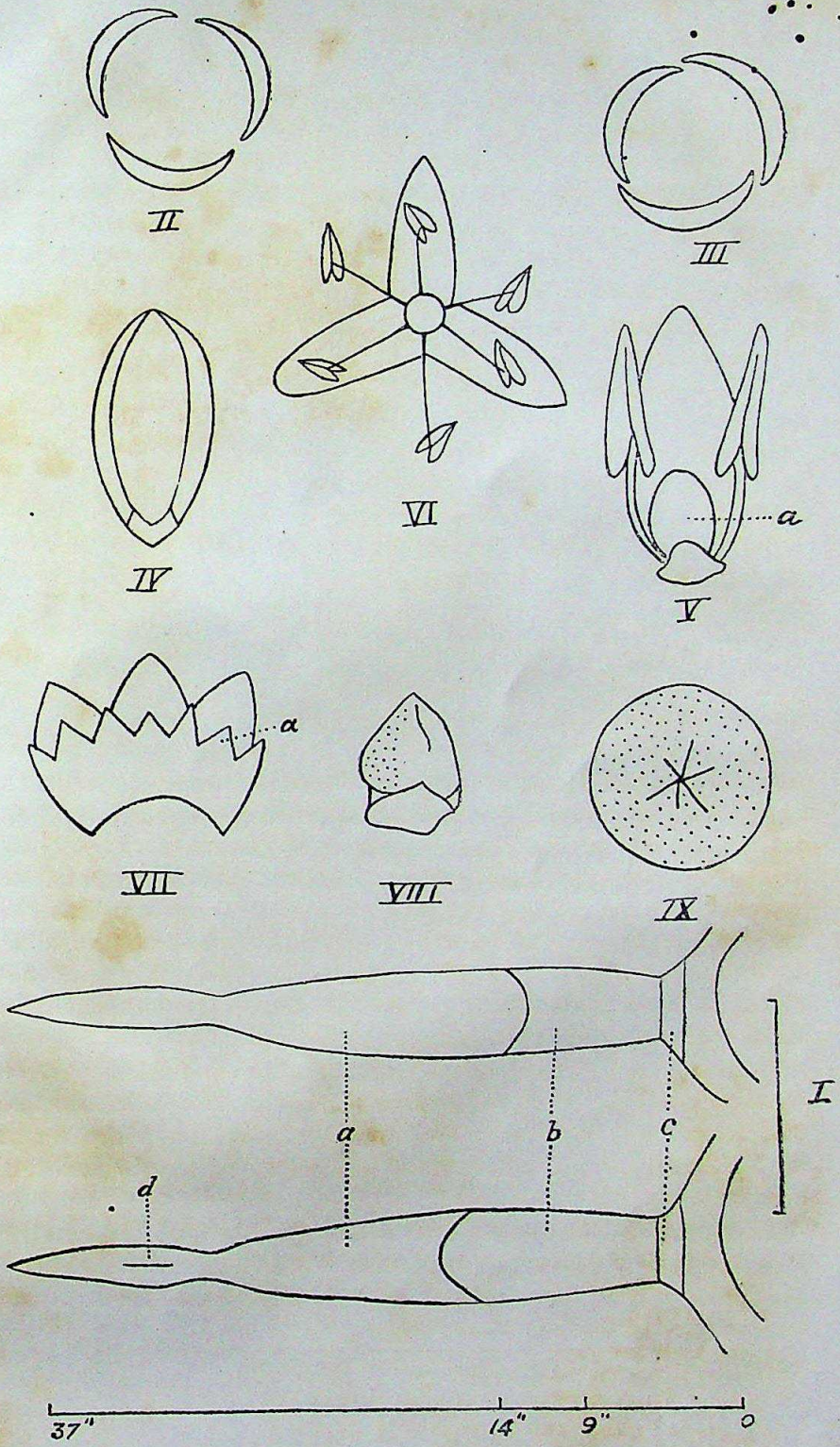


OREODOXA REGIA.

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The flowers are unisexual. The male flowers are in pairs, while the female flowers are solitary. Each female flower is situated between and below every pair of male flowers.

The sepals are three, white, membranous, sub-orbicular and obtuse. The æstivation is imbricate (fig. III.) The sepals of female flowers are longer than those of the male (figs. IV, VIII).

Beccari[1] mentions that it is not seldom to find a second whorl of petals, in male flowers, alternating with the outer whorl of petals. I examined many flowers, but did not notice the presence of this second whorl. The petals are three, white, linear, oblong, obtuse, concave and longitudinally striated. The æstivation is valvate (fig. II.) The petals of the male flowers are longer than those of the female (figs. IV, VIII).

The male flowers when closed are longer than broad (fig. IV). The anthers are pinkish, sagittate and versatile (fig. VI). The stamens are 6-9, nine predominating. The filaments are flattened at the base. A subglobose pistilode, as big as a poppy seed, is situated in the centre of the flower, surrounded by the whorl of stamens (fig. V-*a*). The pistilode is trilocular. The pollen grains are more or less oval.

Bentham and Hooker[2] mention that the ovary is bilocular. I examined many flowers and found the ovary to be trilocular. In some, false dissepiments were also observed (fig. IX). There are six staminodes surrounding the ovary and so to say forming a cupule (fig. VII-*a*). I did not notice any more details in the female flowers, as they had not opened when I examined them.

J. P. MULLAN, M. A.

BOMBAY, 30*th July*, 1909.

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## No. XXXIII.—ENVIRONMENT *VERSUS* NATURAL SELECTION AS THE CAUSE OF COLOURATION IN ANIMALS.

In the course of his very interesting paper "Some Nature Notes," which appeared on pp. 399 *et seq.* of Vol. XIX, No. 2, of the Journal, Col. Burton contributed some remarks bearing on the subject of protective colouration.

The author of that paper looks with suspicion upon the view generally held by naturalists and considers them "rather far fetched". He quotes Mr. Selous, the South African authority, in support of the theory he opposes to that of protective colouration, *viz.*, *the effect of environment.*

This is a matter of great interest which, I believe, has not hitherto been discussed in our Journal, and I hope, therefore, that I may be allowed to trespass in a small measure on its pages.

The views of practical observers like Col. Burton and Mr. Selous are deserving of the highest consideration and they are fully entitled to an opinion, but,

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[1] Beccari l. c.

[2] Bentham and Hooker l. c.

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I venture to suggest that those who agree with them in this matter do so under a partial misconception of the foundations upon which the theory of protective colouration is built. That there is such a misconception I hold to be proved by the presence of the following sentences culled from the two authors.

Col. Burton, in the above quoted contribution, on page 401, writes "I am inclined to think that colouration is far more due to environment, to the colour of the surroundings and to climatic causes, than to *sexual selection* for protective purposes."

Mr. Selous, in his "African Nature Notes and Reminiscences" says, on page 5, line 1, " . . . . The colour of the leucoryx . . . . . has not been brought about *in order* to serve as a protection against enemies." (In both cases the italics are mine.)

I think the misconception in either case is patent, though perhaps the word *sexual* in the first quotation is a clerical error and should read *natural*. It appears to me that both authors have misunderstood the theory of protective colouration by adaptation through natural selection.

It is perhaps possible to agree that some naturalists have claimed to explain too much by the light of this hypothesis, but, reading carefully through Mr. Selous two chapters on protective colouration, the impression created is that he rejects protective colouration altogether, though not positively stating the fact.

Now it is quite possible that environment has some influence on the colouration of animals (though that has to be proved as well as the exact agency through which it acts); but this in no way affects the theory of protective colouration, rather the contrary.

Every one will admit that if it is environment that influences colouration, it must do so in a great variety of shades to account for the great differences in the colour of animals inhabiting the same locality, *e. g.*, tiger, sambar, sloth bear, bison, etc., in India; and the divergence is still more striking in South Africa with the lion, the zebra, the buffalo and the various splendidly coloured antelopes living in the same plains.

This being so, then either all animals, under this influence, should eventually assume the same coats, or else external specific features must tend to disappear as there is nothing to fix the colour, which may, at any time, be gradually changed to any of the other colours brought about by the particular environment.

We here come to the "clou:" *there must be some force or influence to fix a particular colour and we have that agency in natural selection.*

Nothing is more certain than the fact that constant slight variations in dimensions as well as in colour do crop up among animals of the same species. Probably no two individuals are exactly alike in every respect. No one will quarrel, I think, with the assertion that no variation, however slight, can fail to reach in some way on the organism in which it appears. In the vast majority of cases, however, this reaction is so infinitesimal that it may be

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entirely neglected. But a point must come when it is no longer negligible, and now its influence must inevitably be either harmful or beneficial to the animal. Here natural selection steps in. If the variation is definitely harmful it cannot endure, if, on the contrary, it is beneficial it will be handed down and become permanent. I leave out of count such variations that may arise by correlation. These in no sense affect the argument, for it then becomes merely a question of which of the correlated variations exercises the more potent influence.

The mere fact that animals are usually coloured in harmony with their surroundings is no disproof of protective colouration as our authors would infer, for, obviously, to be protected by its colour the animal *must be in harmony with its environment*, subject to certain exceptions that will be dealt with anon.

No one, as far as I know, claims that an animal attains a certain colour or marking *in order* that its colouration should serve as a protection. But rather because it has tended towards a similarity with its environment, natural selection preserves and intensifies the similarity.

There can be little doubt that variations occur in a direction away from the general colour scheme of the environment but it is exactly those variations that natural selection tends to suppress, unless they subserve some other and more important purpose, or the same purpose in another way.

So it may be seen that it is precisely where the hypothesis of protective colouration might fail that that of colouration by the influence of the environment would also fall short.

It is, however, quite possible that environment (in conjunction with other causes) gives the first impetus towards protective colouration and this is then seized upon and worked up by natural selection, which in itself, of course, is incapable of initiating a variation.

Unless it can be proved that it is of advantage in resisting climatic rigours, there is no intrinsic value to an organism in being coloured in harmony with its environment. But where such colour is protective against its enemies or facilitates the obtaining of its food, the benefit is distinct and it will be perpetuated.

One of the points both authors wish to make in disproof of protective colouration, is that it can only be effective when animals are motionless, and that they betray themselves as soon as they stir, even if it be only a switch of the tail. This is obvious and it cannot be contended that protective colouration conceals the animal at all times and under all conditions. In the nature of things this is out of the question for any being less well endowed than the chameleon, and even that reptile requires a little time. But an attentive perusal of Mr. Selous' book will show that protectively coloured animals do benefit by their colouration. It must also be within the experience of every big game hunter to have intently gazed upon an animal whose coat blended with the back ground without seeing it until it has suddenly dashed off, giving no chance of a shot.

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Animals that are protectively coloured are in the habit of remaining motionless when alarmed, thus unconsciously giving full play to their special safe guard.

Again reading Mr. Selous' account of the manner in which lions stalk their prey must convince one that these carnivora owe a great debt to the colour of their skin and, what is more, that they understand how to take full advantage of the fact.

To contend that colouration gives complete protection under all conditions involves one in the following *reductio ad absurdum*. The natural corollary to the contention is that carnivorous animals would never secure any prey, except by mere chance, and therefore, would rapidly disappear through starvation, while at the same time, no herbivorous animal would ever escape from a protectively coloured beast of prey and they too would all succumb.

It is to be presumed that the opponents of natural selection (for that is what it amounts to) admit that colouration and markings in animals are the result of a process of evolution and that the instinct to remain perfectly still under danger is likewise brought about of evolution. Then, believing as they do in the environment theory, they must hold that the two characteristics were evolved separately and unconnectedly and yet eventually were united, for they are shared in the same, or almost the same-degree by every individual of the same species.

This is surely too much to concede. The two traits must have been evolved together and the one as a complement to the other, as each apart would be more or less useless, if not often harmful.

The theory of colouring induced by environment seems to me necessarily to exclude variation in colouration. Once a species is coloured in harmony with its surroundings and *as a result of them*, they would not be able to vary much thereafter, as the same influence, it must be presumed, would tend to bring them back to the type.

But there is nothing more certain than the fact that variations constantly do occur, which variations if harmful will again disappear and if beneficial will endure and become fixed into new types. If the new type has a distinct advantage over the parent the latter will tend to disappear, otherwise the variation becomes a well defined race or variety, and in course of time draws further and more definitely apart and evolves into a new species—possibly eventually into a new genus.

With colouration by environment new species could only arise when some of the individuals of a species migrated to new regions, the environments of which would differ to a certain extent from that they have left. But, as a matter of fact, we know that new species arise in the same localities, the original type often enduring side by side with the new.

It must not be forgotten that, as a rule, the evolutionary process is slow and spread over a period of very many years.

Mr. Selous states that zebras, impala antelopes, giraffes, etc., are very striking

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objects in their natural surroundings and that, therefore, there can be no question of protective colouration in their case. There seems to be a diversity of opinion on this subject, as shown by Colonel Burton in his quotation from Sir Samuel Baker (page 403). However, even admitting that Mr. Selous is right, it cripples his theory of colouration by environment at least as much.

This brings me to the weakest point of the environment theory—it fails to give a satisfactory cause for mimicry. Mr. Selous attempts to prop his case by one reference to those phenomena, but, in my humble opinion, fails entirely to achieve his object.

He describes a South African butterfly—*Precis artaxia*—which below is coloured in the exact resemblance of a dead leaf, but is bright hued above (apparently a very similar insect to the Indian genus *Kallima*). He explains the markings of the undersurface of the wings by the influence of the dead leaves of the forest floor among which this butterfly settles. This indeed must strike one as far fetched. One might admit that, through some at present still mysterious agency, the environment of dead leaves could influence the butterfly to assume a universal sombre hue, or even a blotched appearance vaguely resembling the colour and shape of a dead leaf, but that it can call into being markings closely copying the venation of a leaf and add a short tail to the hind wing to represent the leaf stalk, is more than the imagination will rise to.

Then, too, how is one to account for the bright colours of the dorsal aspect of the insect? Is one to understand that the action of the environment is more or less of a photographic nature and does not act on the upper surface because the wings are usually held applied together, or because they are turned away from the dead leaves? Accepting the influence of environment it seems more reasonable to believe that the effect is through a reaction of the whole vital organism and not merely on surfaces exposed.

Mr. Selous goes on to state that there seems no reason why butterflies in South Africa should be protectively coloured as he has never seen a bird attempt to catch a butterfly, but these insects have other enemies, lizards for instance.

There are numberless examples of more or less perfect mimicry, some so minutely accurate in every detail as to be absolutely inexplicable except by adaptation for protective purposes working through natural selection.

And this adaptation must be not merely on the one side but interacting on both—the prey and the preyer. The one becoming more and more perfect for concealment while the other becomes more and more qualified to detect the fraud.

At least no more plausible, no more convincing hypothesis, indeed no other credible explanation, has as yet been suggested to my knowledge.

It was Bates, I think, who described an incident of which he was an eye witness in South America. I write from memory and may be incorrect in detail, but the main facts are accurate.



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Bates observed a species of mantis that closely imitated a leaf which found itself in the track of an army of the terrible foraging ants of those regions. Seeming aware of its dangerous situation it remained perfectly inert, while the ants crawled over it and left it unmolested. Had it moved in the slightest it would inevitably have been torn to pieces.

Again we have butterflies that obtain comparative immunity through their close resemblance to other lepidoptera which are distasteful to animals that prey on this class of insects. Others again mimic bees and wasps. Certain spiders and mantids in this country are fashioned so as to be indistinguishable from ants without the very closest scrutiny. Other spiders escape detection through their similarity to the particles of debris that conglomerate in their webs and among which they squat motionless. Yet another Indian spider—*Peucetia viridana*—is strikingly like the fruit of a small shrub—*Jatropha gossypifolia*. It undoubtedly secures much of its living booty by squatting among flowers and pouncing on unwary insect visitors in search of honey, they mistaking the spider for the fruit. This spider does not restrict itself to the shrub referred to and may be found on other shrubs, therefore its colour and marking cannot be due to environment. Besides why should it not resemble the flowers of *Jatropha*, the latter are more striking, being red, the berry being light-green traversed by a few whitish lines—all of which as well as the long hairs on the stalk are admirably reproduced on the spider's abdomen and legs.

Let us now consider the bright and very showy colours of certain caterpillars and Orthoptera, or of the large spider common in many Indian jungles, a very conspicuous object suspended in the middle of a large yellow viscous web stretched across paths or clearings—*Nephila maculata*. These colours cannot be accounted for as induced by environment. They are, however, explained by natural selection, for they are *warning colours*. The creatures thus coloured are distasteful to the enemies of allied animals for one reason or another, and it is to their advantage to blazon abroad, that all that fly may know, the fact that they are unsavoury—perchance poisonous.

That this is not mere speculation is proved by many recorded observations. In the pages of our Journal some years ago (I have not access to my books at present) a note was published on the subject of a bear in captivity, that held brilliantly adorned locusts in abhorence, though inordinately fond of others of more sober (protectively coloured) dress.

Numerous other facts of a like nature might be quoted, but I need only refer the reader to the pages of Darwin and Wallace and I will content myself with one more and that perhaps the most striking of any, in support of my thesis.

I ask how else than by the theory of protective colouration fostered by natural selection is the extraordinarily faithful imitation by certain moths of the excreta of birds to be explained. These moths usually lie on green leaves just in the position chance-fallen excreta would take up. It requires a close inspection to recognise the one from the other, as any one who saw this

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year's Darwin exhibit at the Natural History Museum at South Kensington will testify to. And the resemblance in living specimens is still more deceptive.

Here, surely, no sketch of imagination can bring environmental colouration into play—that would require the moths to be green.

To me the recital of the above arguments seem to prove conclusively that whatever the effect of environment on the colouration of animals it cannot explain all the known facts, whereas protective colouration (including warning colours) through the agency of natural selection, does.

While on the subject of Colonel Burton's article perhaps I may be permitted to add a note to his remarks anent wanton slaughter by tigers.

Some years ago in Ganjam a tigress, accompanied by two cubs still too young to do their own killing, butchered four cows at different points several furlongs apart in the same night. Only one was partly eaten and a native shikari shot the tigress at this kill while I was preparing to sit over one of the others, not having heard till too late that there were more than one. The explanation in this case may be that the mother was instructing her cubs in the art of cattle killing.

C. E. C. FISCHER.

COIMBATORE, *4th December* 1909.

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## No. XXXIV.—ON THE OCCURRENCE OF THE BUTTERFLY *ATELLA ALCIPPE*, CRAMER, IN TRAVANCORE.

Through the courtesy of the Director of the Government Museum, Trivandrum, I have had sent me a specimen of the above butterfly, which was captured by Mr. Hockin at Kalasagarem in June 1906. This is the first occurrence of this insect in Travancore, and I was not aware, until the last number of the Journal appeared (No. 3, Vol. XIX), that it occurred in S. India at all but Mr. Bell states that it is very local in Kanara.

We can now understand how the butterfly reached Ceylon, which before was inexplicable. When I described the Ceylon form under the name *A. alcippe* race *ceylonica* (Vol. XIV. p. 716), the nearest habitat then known was Sikhim and the Andaman Islands. The specimen from Travancore conforms to the type, and is markedly different from the Ceylon race, which is distinguished by the uniformly black apex to the forewing. The late Mr. de Nicéville gave a useful list of the known species of the group in his paper entitled "On new and little known butterflies, mostly from the Oriental region," Vol. XIV. p. 243.

N. MANDERS, LIEUT.-COL., F.Z.S., F.E.S.

COLOMBO, *December* 1909.

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## EXTRACTS FROM THE PROCEEDINGS OF THE MEETINGS OF THE BALUCHISTAN NATURAL HISTORY SOCIETY HELD IN THE QUETTA MUSEUM AND LIBRARY BUILDING ON 29TH JULY, 26TH AUGUST, 30TH SEPTEMBER AND 28TH OCTOBER 1909.

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*29th July* 1909.

Read letter dated the 28th July 1909, from Major F. C. Webb-Ware, C.I.E., and an extract from letter of the same date from Mr. G. H. Frost, regarding the Quetta Cicada. The Honorary Secretary remarked that on the 3rd July he found a pupa crawling on the ground and that the flying insect emerged in an hour's time. He also remarked that all the flying insects in the station had disappeared by about the 10th of the month.

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*Dated 20th July* 1909.

DEAR MR. CUMMING,

Your interesting note on the subject of the Cicada which recently appeared in such numbers in Quetta. I have been connected with Quetta now for nearly 20 years, but I certainly do not recollect the swarms or in fact any but isolated insects of this species. There is a small type of this same insect which is common to Baluchistan, and is usually to be found where fairly long grass grows. For instance, I have frequently seen it at Pishin. The pupa in, I think, the larger number of cases emerges in its pupa covering from the ground and climbs on to a branch of the nearest tree. You will always find their holes below trees or bushes. The pupa then suns itself for a short period and emerges from its covering which splits open down the back. After sunning itself for some little time, the fully developed insect dries and then can take to flight. The noise they make is due to the rapid vibration of a membrane which is situated on either side of where the body and extremity join. They emit three or four notes, and I dare say you noticed that the Cicada on one tree always emit the same note. The most interesting fact to ascertain is why it is that these insects should have appeared in such numbers this year, also their method of propagating their species, etc. In Australia you obtain various kinds of the same, but they run to 1½ to 2 inches long, and have the most brilliant colouring, gold being common. In Seistan the Cicada—a small black type—used to give us considerable trouble by appearing uninvited at dinner.—Yours sincerely.

F. C. WEBB-WARE.

DEAR SIR,

I notice the black ants are carrying the eggs of the Cicada away and should therefore be the means of great reduction in the number that comes to the larval stage.

(Sd.) G. H. FROST.

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Read letter, dated the 16th July 1909, from Captain A. D. G. Ramsay to the Hon'ble the Agent to the Governor-General, suggesting that Bee-keeping be tried as an experiment in Baluchistan ; also a note by the Honorary Secretary to the effect that, although no honey bees had so far been found in Quetta, he did not see why they should not thrive if imported. He added that honey was procurable in parts of Chagai District. Mr. Porter remarked that honey was also to be found in Hindubagh and the Khojak, and that Mr. H. R. C. Dobbs, the Offg. Revenue Commissioner, was in correspondence with him, with a view to experimenting with Bee-keeping in Quetta. The members were of opinion that they knew of no reason why the experiment should not prove a success.

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*26th August* 1909.

The Honorary Secretary then passed round for inspection :—

(1) A collection of vertebrate fossils, mostly from the Bugti country. which had been kindly identified for the Museum by the Director, Geological Survey of India, Calcutta.

(2) A collection of local butterflies and bugs kindly named by Colonel C. Swinhoe and Mr. Waterhouse of the British Museum.

(3) A wagtail returned by the Honorary Secretary, Bombay Natural History Society, which had been identified by Dr. Hartert of Tring as "a female of *Motacilla citreola* or *citreolades.*"

(4) A copy of "Saunder's Manual of British Birds," purchased by the Museum.

(5). A sample ( 6 inch cube ) of Baluchistan marble from the Nahar Nallah, near Quetta, presented by Mr. C. H. Dracott, with an analytical report thereon by Mr. James Cleghorn, Consulting Engineer.

Read letter No. Herb, 275-1-7, dated 17th June 1909, from the Superintendent, Royal Botanic Gardens, Calcutta, identifying a curious horned fruit found at Ahmadkhanzai near Quetta, last March, as *Martynia proboscidea.*

The meeting was then thrown open to the members, and Lieutenant Bignell reported that he had come across several Cicada during the 1st week of August on the top of Tsut hill, a little over 10,000 feet.

There being no further business, Major Goodwin thanked Mr. Dracott for his gift of a sample of Baluchistan marble and for the analytical report he had obtained on it. He then asked the members to do what they could to bring in specimens of the various bugs of the country, many of which were new to science, and reminded them that the birds were once again passing through the country on migration and affording collectors a fresh opportunity of adding to their knowledge of the avifauna of Baluchistan.

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*30th September* 1909.

Read list of donations made to the Museum during the month, the exhibits themselves being passed round for the inspection of members except in the case of three very interesting live snakes, a 9 feet Python, a Cobra ( in cage)

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and an *Eryx johnii*, found by Mr. Flynn at the river Habb between Sind and Baluchistan, which were placed on the table and viewed at a respectful distance by some of the members who left their chairs for the time being. Of the other exhibits, the most important were a Beech Marten from the Staff College, presented by Miss Tranaka, a Common Wryneck from Quetta, presented by Lieutenant A. M. Lloyd, and a lot of butterflies from Ziarat, collected and mounted by Mr. B. H. Ford.

Read note from the Hon'ble President, expressing his delight with Mr. Ford's collection of butterflies.

Resolved that the thanks of the members be conveyed to Mr. Ford for his valuable collection of butterflies.

Read appeals published by the Bombay Natural History Society:—

(1) From Mr. E. C. Stuart Baker, asking for information as to the breeding of the rarer species of Grouse with eggs of all species either on loan or as gifts in exchange, and for information as to the dates on which Woodcock, Snipe and Jack Snipe are first and last shot in any part of India, the relative dates of arrival and departure of Fantail and Pintails, and the proportion they form in bags made at different times of the year.

(2) From Professor Powell, of the Northcote Hospital, Bombay, for large Earth Worms, either alive in some of the earth in which found or in methylated spirits.

(3) From Mr. N. B. Kinnear, Keeper of the Museum, Bombay Natural History Society—

(*a*) For beetles common or rare from all over the Indian Empire; and

(*b*) For information on the migration of birds.

Resolved that members be requested to do what they can to assist in the above directions.

Read letter, dated 13th September 1909, from Mr. James Cleghorn, C.E., Consulting Engineer, Calcutta, to Mr. C. H. Dracott, reporting on the utility of the Baluchistan marble for general building purposes.

Read note by Mr. C. H. Dracott, recording particulars regarding some *Psychidæ* larvæ he had found at Hanna, and specimens of which were passed round for inspection.

Read note from the Hon'ble Sir Henry McMahon, stating that he had ascertained, from the Zoological Society, London, that "Dresser's Birds of Europe," now out of print, was the best standard work on the Birds of Europe, and that he was writing direct to Mr. Dresser, who has a few spare copies, asking the terms on which he would let the Quetta Museum have one.

Read letter, No. 470, dated 16th September 1909, from Mr. Maxwell-Lefroy embodying an interesting report on a specimen of the Lygaeid with pupa skin and fly which was found by Mr. A. A. Flynn in Quetta last May, and had been forwarded to Mr. Lefroy for favour of identification.

In addition to the donations received during the month, the Python (*Python molurus*), Cobra (*Naia tripudians*), and Double Headed Snake (*Eryx johnii*)

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exhibited alive by Mr. Flynn at the last meeting, and which had since been killed and mounted by Mr. Flynn, were also passed round for the inspection of such of the members who were absent on that occasion: while Mrs. Drake exhibited a curious pair of Markhor horns found on the Murdar Range, in which one of the horns was of the close spiral form after the Sulieman type, and the other had open curls, like that of the Astor type.

Read letter, No. 633, dated 9th October 1909, from Mr. Maxwell-Lefroy, stating it was impossible to identify the *Psychidae* larvæ presented by Mr. Dracott, but that he would do so later if any of them developed into moths.

The Hon'ble President then concluded the meeting with a few remarks. He suggested that the Samber head and other exhibits, not of local origin, which had been placed in the Museum, be kept apart. He desired that the thanks of the meeting be conveyed to Mulla Alif for the leopard skin he had sent in and expressed a hope that it would not be long before another would be secured. He further referred to the appeals read at the last meeting, and expressed the hope that members would respond by sending in their observations on the arrival and departure, etc., of Woodcock and Snipe, and the migration of birds in general, and expressly asked that advantage be taken of the present shooting season to secure and send in specimens of snipe, grouse, duck, hare, etc.

In conclusion he mentioned that when passing through Bombay on his return from leave, the Honorary Secretary, Bombay Natural History Society, desired him to thank the members of the Baluchistan Natural History Society for their help to the Bombay Natural History Society.

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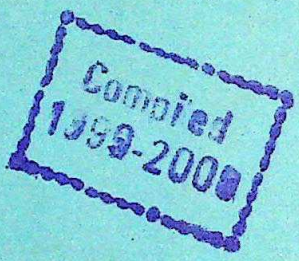


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